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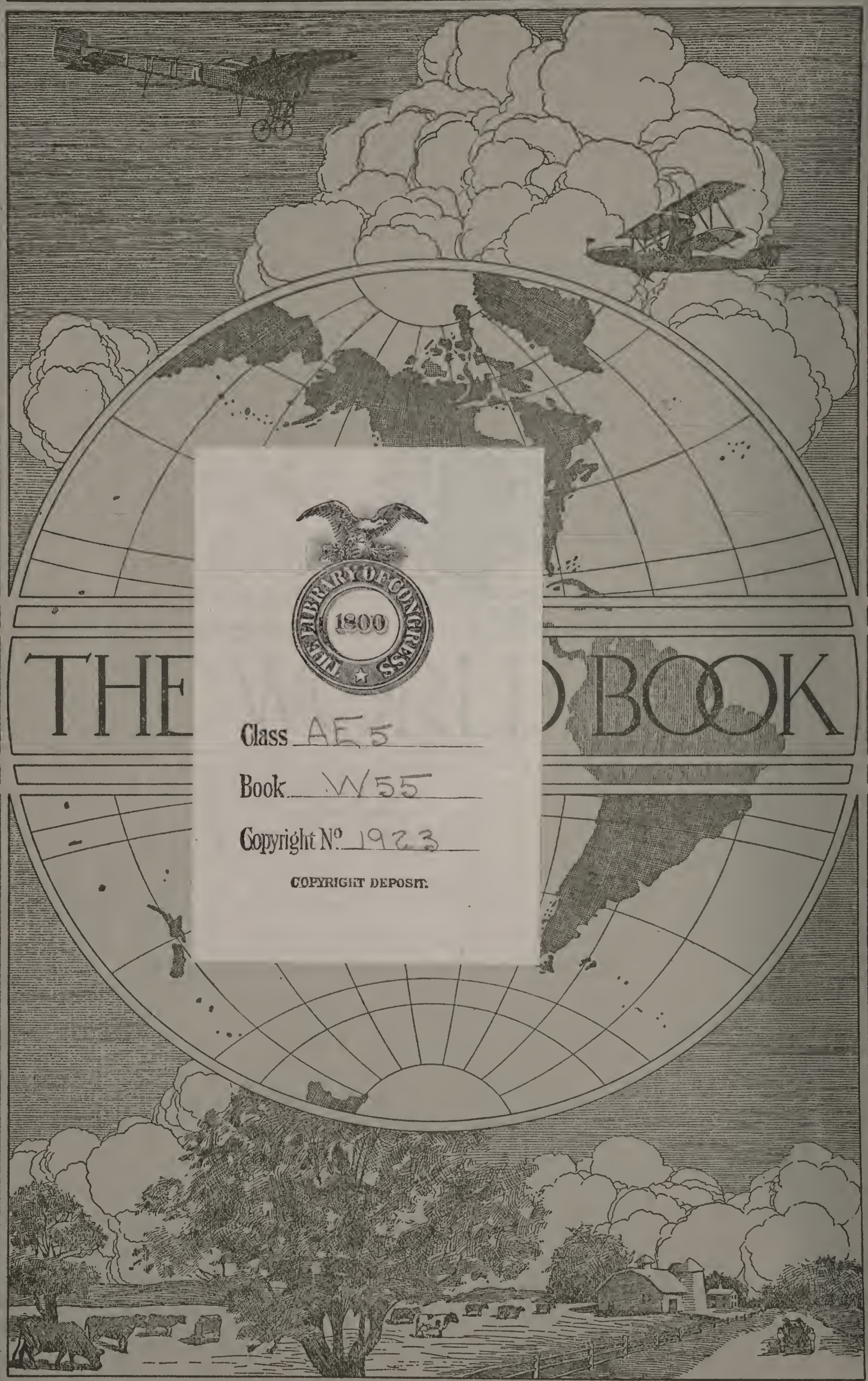

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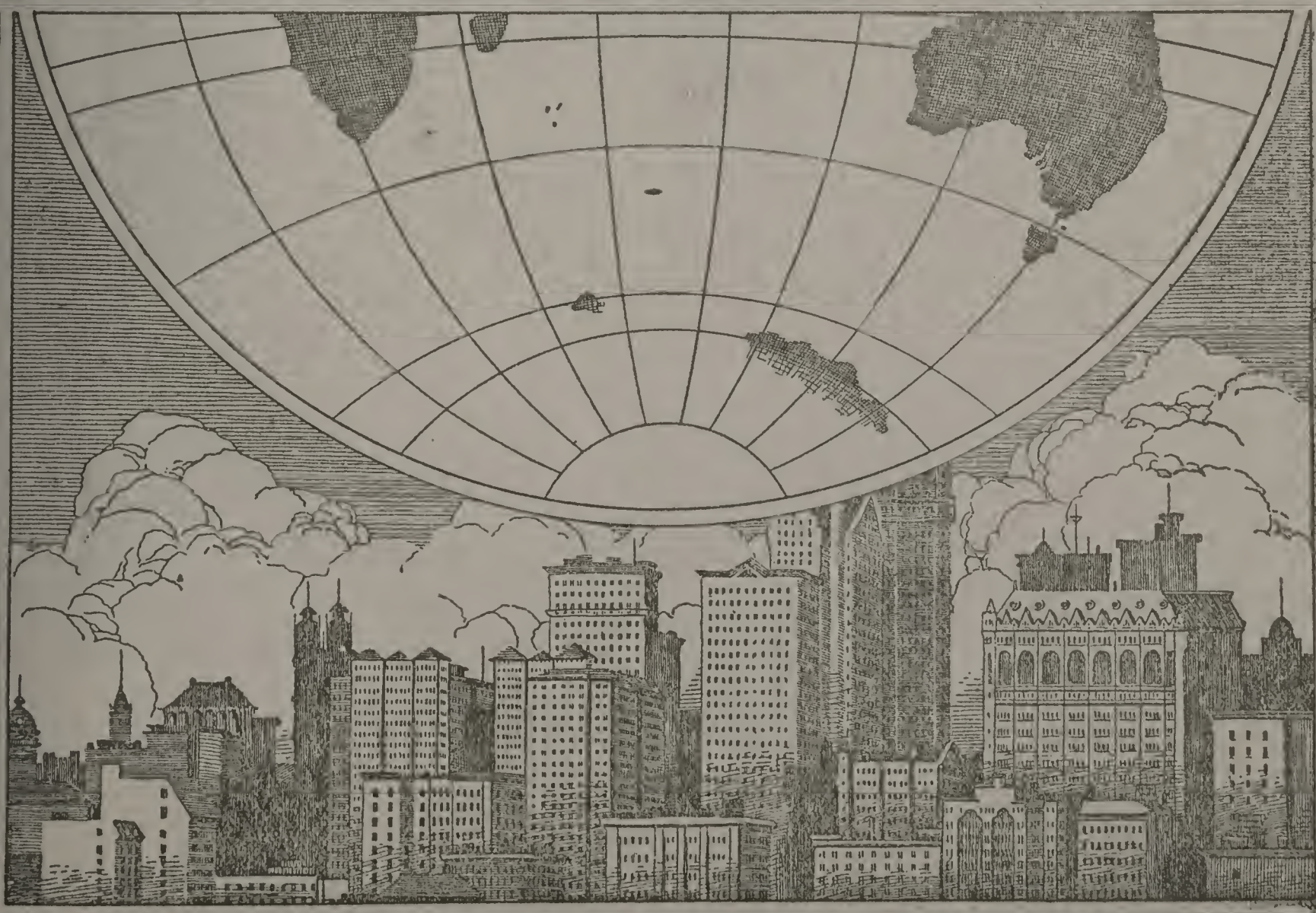

THE WORLD BOOK

ORGANIZED KNOWLEDGE IN STORY AND PICTURE

TRADE MARK REGISTERED

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VOLUME THREE

CHILD STUDY, the term applied to the systematic study of children. Child study is of two kinds: one may be termed scientific, requiring delicate instruments and conducted only by trained experts; the other is that which requires no apparatus and may be carried on by every parent and teacher. Laboratories for scientific child study are found in a few teachers' colleges and state normal schools and in most of the large universities. In the article CHILD in these volumes the growth and development of the young child are fully described, and in the article ADOLESCENCE the characteristics of the "teen" age are discussed. This article is devoted to the consideration of that kind of child study which is open to every one interested in children.

Child Study in the Home. All parents are interested in the welfare and the fullest development of their children, but many fathers and mothers feel that child study is something for which they are wholly unprepared. All too often they restrict the meaning of the term to the investigations of experts in the laboratories of normal schools and universities. To these parents we would offer a word of encouragement. While expert training is of great assistance, it is not essential to the successful prosecution of a wide range of observations. But the anxious mother inquires, "What can I do?" She can do many things, and in response to this inquiry the following suggestions are offered:

1. *Try to put yourself in the child's place.* Think back so far as possible to your own childhood and get the child's point of view. Wrong conclusions are frequently drawn because the adult judges the child's acts from his own viewpoint. "The child is the rightful owner of his own potentiality, which constitutes his individuality and his personality. * * * The parent's judgment cannot be infallible, and he must therefore be in the habitual attitude of a learner."

2. *Look for the good points.* Parents are prone to magnify the faults and overlook the virtues of their children. Many acts which are considered faulty, because they are contrary to the parents' views of what should be, are not faulty at all when looked at from the child's viewpoint. They are the spontaneous expression of the energy with which his system is surcharged. By emphasizing the child's virtues you help him to overcome his faults, while by magnifying his faults you keep them constantly before him. We do not mean by this that the child's faults should be ignored, for if the child is to be helped in his development you must know his elements both of strength and of weakness. What is suggested is that you help him to make his virtues so strong that they will drive out the faults.

3. *Watch for tastes and aptitudes.* What does your child like to do best? Of what articles of food is he most fond? What members of the family does he prefer, and why? These questions cannot be answered offhand. The right answers will be found only through prolonged study, but the study will lead to a knowledge of the child which can be gained in

no other way. Moreover, this knowledge is necessary to the right directing of the child's energy and interests. Many people are "misfits" in the world because they were led or forced into occupations for which they have no natural aptitude. Because the father is a lawyer is no reason why his son should choose that profession.

4. *Discipline.* What is your idea of discipline? Do you require obedience because you desire to assert your authority? Do you command the child to be quiet because the noise he makes in his play disturbs your ease and comfort? Do you require him to do this or that because his doing it will merely help you, or do you require obedience for the good of the child? Granting that this latter is the purpose, to what sort of obedience should the child be subjected—that of external authority or that of his own will? In other words, shall it be the discipline of suppression or the discipline of liberty? "Discipline," says Madame Montessori, "must come through liberty"; and, "If discipline is founded upon liberty the discipline itself must necessarily be active." Study, then, to lead the child by suggestion and encouragement into activity along right lines. This is more difficult and requires more time and patience than the old method of command and suppression, but this old method produces an individual *suppressed,* not disciplined, while the first produces an individual who is master of himself and able to regulate his own conduct.

5. *Indulgence.* The question of discipline naturally leads to that of indulgence. "If my child is to obtain liberty through discipline shall I allow him to have his way in everything?" It would seem that no fixed rule governing this point can be established, for what might be a harmful indulgence to one child would not be such to another. The child should learn through his daily experiences that he cannot indulge in those practices that are contrary to the welfare of the other members of the family, and he will learn this for himself if proper influences are thrown around him. The new baby should not be allowed to become the tyrant of the household, though within the bounds of the mother's best judgment he should be allowed his freedom.

We usually consider "spoiled" children to be those whose every wish has been granted until they have become intensely selfish and inconsiderate of others. But there are many children who have been spoiled in another way which is often much more harmful and far-reaching in its results. This refers to those children who have had their natural aptitudes suppressed and their desires killed because their tendencies did not harmonize with the preconceived notions of father or mother. In these cases the self-indulgence of the parent may be more injurious than his over-indulgence in gratifying the child's less important desires. Can parents afford to cripple the child's future usefulness and prevent his fullest development merely to gratify their notion of what he should do in life?

6. *Play.* Study the child at play and teach him simple games. To do this the mother must so enter into the spirit of the games that the child will respond readily to her efforts. In what games does the child seem to take the greatest delight? When he begins to play with other children how does he treat his playfellows? Suggestions for this study are given in the article PLAY.

Child Study in the School. The home and the school should coöperate in the study of the child. The suggestions already given may apply to this work in the school as well as in the home, but there are other lines of work which from the nature of the case can be carried on more successfully in the school. The teacher should study her pupils for the purpose of discovering—

1. *Defective Children.* Children are often considered dull when the cause for the apparent dullness is defective sight or hearing. The teacher should try to discover any cases of this kind early in the term so the defect, so far as possible, may be remedied. Children whose sight or hearing is defective are usually very diffident, and they seldom speak of their difficulty. It must be detected by the teacher.

2. *Likes and Dislikes.* Some children apparently find as much interest in one subject as in another; others show marked differences. Some like arithmetic, but take no interest in language studies. Some prefer language to arithmetic; others prefer history and geography to other subjects. But the teacher's most difficult problem in this line of study is to discover what interests the boy who shows a dislike for all school subjects. When this interest is found, through it he can usually be led to take an interest in related subjects, and his progress in school begins.

3. *Temperaments.* Children's temperaments and dispositions can be studied to best advantage when they are assembled in groups, as in

the school. Here the leading characteristics of each child are strongly brought out in his association with other children and in his attitude towards his work. One child is quick, nervous, very sensitive and easily irritated; another is slow, phlegmatic and apparently not disturbed by anything. Somewhere between these extremes we may classify the other pupils, some leaning towards the nervous type and others towards the phlegmatic. Those pupils in whom these characteristics most nearly balance will do their work with the least fatigue and with the least attention from the teacher. The tendency of the nervous child is to intensity of application and overwork. He needs constant oversight and frequently a caution against overwork. On the other hand, the slow child needs frequent encouragement, but over him the teacher should not become discouraged. His condition is due to physiological causes, and within due time, to use a familiar figure, the tortoise may overtake the hare, with more than a fair prospect of winning the race.

Work of the Specialists. Advanced child study must be left to experts who are specially trained for it and who have well-equipped laboratories at their disposal. The work of these specialists is of the greatest value. They have made many discoveries and collected and classified facts upon which others can rely for guidance. Their works will be found helpful to anyone interested in child study. Many of the theories they have set forth and the questions they have raised form suitable topics for discussion at mothers' meetings and the meetings of parent-teacher associations.

History. Children have been studied, trained and educated in all ages and by all peoples, but it is only within the last century that child study has received the attention of eminent educators and been carried on in a scientific manner. Since 1880 child study has become widely extended and now includes within its scope all subjects pertaining directly to the welfare and the development of the child. In the higher institutions, however, some of these subjects have been classified under psychology and others are considered under experimental pedagogy. W.F.R.

Consult Fisher's *Mothers and Children;* Hall's *Youth;* Puffer's *The Boy and His Gang;* Holmes' *Backward Children;* Lee's *Play in Education;* Kirkpatrick's *Fundamentals of Child-Study;* Healy's *Honesty;* O'Shea's *Social Development and Education;* McKeever's *Farm Boys and Girls.*

Related Subjects. In addition to the articles listed in the "related subjects" index under CHILD, the following articles may well be consulted in this connection:

Adolescence
Child, The
Juvenile Court
Natural Education
(Subtitle under EDUCATION)
Parent-Teacher Associations
Women's Clubs

CHILE, *che'lay,* or **CHILI,** *chil'i,* a progressive republic in South America, extending ribbonlike along the Pacific coast for 2,700 miles. Its average width is but eighty-seven miles. If placed on the map of North America, this country (about thirty times as long as it is wide, and therefore sometimes called the *shoestring republic*) would stretch from Hudson Bay to about 200 miles south of Cuba. It is divided into twenty-three provinces and one territory, and has an area of 292,575 square miles, this being equal to that of Texas and half of Oklahoma. It had in 1920 a population of 3,754,723, which is about ten times that of the province of Alberta, Canada, though Chile is but little larger. Among South American countries, Chile ranks fourth in population, fifth in density of population, and seventh in area. On the north is Peru; on the northeast and east are Bolivia and Argentina; the Pacific Ocean washes the western shore; a large part of Tierra del Fuego (the Land of Fire) and the famous Island of Cape Horn constitute the southern extremity of Chile, which is projected a thousand miles farther south than the southern point of Africa.

The name *Chile* is Indian, but its origin is disputed. It was probably derived from an

Indian word meaning *cold,* referring to the perpetual snow on many of the mountains.

The People. Chile does not have an excessive foreign population. More than 3,000,000 of the people are natives; and of this

A STARTLING COMPARISON

Northern Chile is as far south of the equator as Haiti is north of "the line"; its southern extremity is in a latitude comparable with Southern Hudson Bay. The above map shows where Chile would lie could it be turned upon North America, with the equator as an axis.

native population more than a fourth is of pure Spanish stock. Very many of the influential families have been settled in that country for more than a century. Happily for Chile, its colonial families came very largely from the northern provinces of Spain, the people of which are industrious, thrifty and progressive, in contrast with the more romantic and excitable people of the southern provinces of that interesting land. Just as the northern provinces of Spain are the cooler, so the more southern lands of South America are the cooler; for both of these are located at a considerable distance from the torrid heat of the equator.

All Chileans speak the Spanish language, and nearly all of the natives profess the Roman Catholic faith. The social customs of Spain are everywhere in evidence, and these generally reflect the high culture and refined etiquette of old Spain. There are in Chile about 150,000 European foreigners, who have been drawn thither generally for purposes of business. These are chiefly Spanish, French, Germans, Italians and British. There are also 50,000 Peruvians and Bolivians in the north.

Of the ancient inhabitants of Chile, the *Araucanians* and the *Patagonians* have been famous the world over for ages, though only about 100,000 of the former remain, and the latter are practically extinct. The Araucanians had an intense love for liberty and a determined, warlike spirit, and they were the last native tribe in all America to give up their independence. Not until 1870 did they actually recognize the authority of the Chilean government (see PATAGONIA). Chile has practically no negro population, and has not been vexed with problems growing out of African slavery.

The Land Surface and Climate. Entering Chile at the north, behind the steep coast table-land of granite and mica rocks, called the Coast Cordillera of the Andes Mountains, one finds first a desert section in the torrid zone, rising to meet the Bolivian plateau and having an altitude of from 12,000 to 14,000 feet. Its climate is sub-tropical. In that section in the Andes, which forms the unbroken eastern wall of the republic, are numerous volcanoes, the Llullailaco being 100 feet higher than the celebrated Chimborazo in Ecuador. In the center is a rich valley 600 miles long, of almost tropical verdure, watered by numerous small rivers rising in the Andes. This agricultural section of Chile, where the rain supply is fairly abundant, has an even, pleasant climate, with the evenings always comfortably cool.

Finally, in the southern portion is found a mountainous, heavily-forested section, a cold region with almost continuous rains. Here, where the famous Strait of Magellan cuts through Chilean lands, the otherwise uniform coast line breaks into picturesque ruggedness. The fiords and islands and forest-covered mountains topped with glaciers remind one of the romantic scenery of Northern Europe. The Chilean portion of the Andes has an average elevation of 6,000 feet in the south, and 15,000 feet in the north. These mountains are more heavily clad in snow than any other part of the great range.

The rivers are of little importance for transportation, being short and turbulent, but several in the south, the Imperial, Bio-bio, Valdivia and Bueno, are navigated by small steamboats for some distance. Unlike many South American countries, Chile has few birds, beasts, fish or reptiles.

Mineral Resources. Chile is one of the chief mineral-producing countries of South America. Its mineral wealth was the cause of early disturbances concerning territorial rights, for the northern desert of the country is the chief

LOCATION MAP

Showing the position Chile occupies in the continent, and its size as compared with other South American republics.

source of the world's supply of nitrate of soda, one of the finest fertilizers known.

Nitrate of Soda. The export trade in this whitish-looking mud, so easily obtained by a surface-scraping process, produces a yearly tax revenue of about $35,000,000, United States money—enough to pay one-third of the expenses of the republic. About three million tons are exported each year, an average of 10,000 tons each working day. Almost all of it is sent to Europe and the United States, Iquique being celebrated as the world's greatest nitrate port. Chileans believe this source of easy wealth will last forever, but scientific men have estimated that the supply will be exhausted by 1940. A by-product of nitrate of soda, which is also a considerable article of export, especially to the United States, is iodine, used in medical practice and in photography.

Copper ores are next to nitrates in importance among the mineral resources. In 1875 Chile was the largest producer of copper in the world, but it now holds sixth place. Deposits of iron ore in the province of Coquimbo are estimated at over 200,000,000 tons. Gold, silver, cobalt, nickel and manganese are also mined, and coal, zinc, iron, mercury and chalks are found in small quantities.

Agriculture. Most of its agricultural activities are confined to its great central valley, where there are large estates owned by wealthy Chileans and by the Roman Catholic Church. These estates are worked with modern machinery. The poorer classes serve as laborers, for they cannot own farms because of the high price of land. Yet statistics show that about half of Chile's population is engaged in agricultural pursuits. The most important crops are wheat, barley, oats, maize and beans. Next to the growing of cereals the most important agricultural industry is grape raising, about 250,000 acres being devoted to that purpose. Flax, hemp and tobacco are cultivated to some extent. Apple growing has become very successful, especially in the southern portion.

As pasturage is good the year round, cattle raising is another prominent industry. Sheep and pigs are numerous, especially in the central valley. Dairy farming and the production of butter and cheese are on the increase. The southern portion is chiefly a lumber district of cedar, Araucanian pine, cypress, beech, poplar, willow, chestnut and eucalyptus.

The government of Chile has made a call for settlers, offering special inducements, and a considerable number of Japanese farmers have already answered the call.

Manufacture and Commerce. The natives of Chile do not take to manufacturing, and as the foreign element is still small, manufacturing industries are unimportant. Soap, furniture and shoes are the chief products, except in a southern German settlement at Valdivia, where large breweries, distilleries, saw mills and tanneries are found. Cottons and woolens, coal, oil, machinery, paper materials, animal products and chemicals have for years been imported from Great Britain, Germany and the United States.

Transportation and Communication. Chile was the first South American state to construct a railway, the oldest line having been opened in 1852. By 1888 the construction of railroads was begun on a large scale, and in 1920 there were more than 5,400 miles of railway open for traffic, over 3,100 miles of which belong to the state. Numerous new lines are being planned.

One of the most important in operation is that connecting Valparaiso and Buenos Aires, Argentina, a distance of nearly 800 miles. Chile has over 9,000 miles of public road and about 400 miles of navigable rivers.

Although harbors on the Chilean coast are not of the best, shipping from its ports exceeds that of any other South American country on the west coast. An excellent breakwater recently built at the Valparaiso harbor has greatly improved that port and made anchorage safe. Besides Chilean lines, several British, German and Italian companies in normal times give continuous service, the chief ports being Valparaiso, Iquique, Talcahuano and Antofagasta. The completion of the Panama Canal, greatly shortening the water route to Chile from New York and Europe, is vastly increasing the republic's commerce. The ocean route from Valparaiso to New York has been shortened from 8,337 miles to 4,627 miles, and that from Valparaiso to Liverpool from 8,747 miles to 7,185 miles.

There are extensive systems of telegraph and telephone lines throughout the country, and several wireless stations have been installed.

Education. Until recently, public instruction was in no satisfactory condition; but rapid strides have been made, and through the efforts of teachers brought from Germany and the United States, modern methods and systems have been installed. Education is free and at the expense of the state, but it is not compulsory. There are over 3,000 public primary schools, and almost 500 private primary schools. Besides sixteen normal schools, eighty-six secondary schools, eleven commercial schools, all public, there are agricultural and professional schools, schools of mines, music, arts and trades, an institute for deaf mutes, a school for the blind, public museums and the National Library with almost 200,000 volumes.

Commercial Opportunities. The Panama Canal will very largely do away with the rounding of Cape Horn, and the city of Valparaiso will miss the endless procession of passing ships that for three centuries have called at its harbor; yet neither this diversion of ships from the old water route to the new nor the diversion of transportation from ships to railways is necessarily a menace to the prosperity of the republic. Its commerce should rather be stimulated by the shorter routes and easier transportation.

The years of construction of the canal were marked by energetic action on the part of Chileans. Especially has this been notable in the mining industry. Within eight years (1907-1915) the production of copper advanced from 26,000 tons to 45,000 tons, and it is expected that that output will be doubled by 1920. A new National School of Mines is to be established at Coronel, in the mining district. New railway lines are needed to meet the new conditions. A "chain" of modern hotels, on the American plan, is so earnestly desired that efforts have been made officially to induce North American capitalists to construct them. In Chile, as in some other South American countries, there are openings for North American banking houses to do a profitable and safe business. Valparaiso has twelve banking houses, of which five are native, three German, two English, one Italian and one Spanish; North America is not represented. Production of beet sugar in Chile on the American plan has been suggested as holding possibilities, for Chile consumes a surprising amount of sugar and yet places a protective tariff upon it.

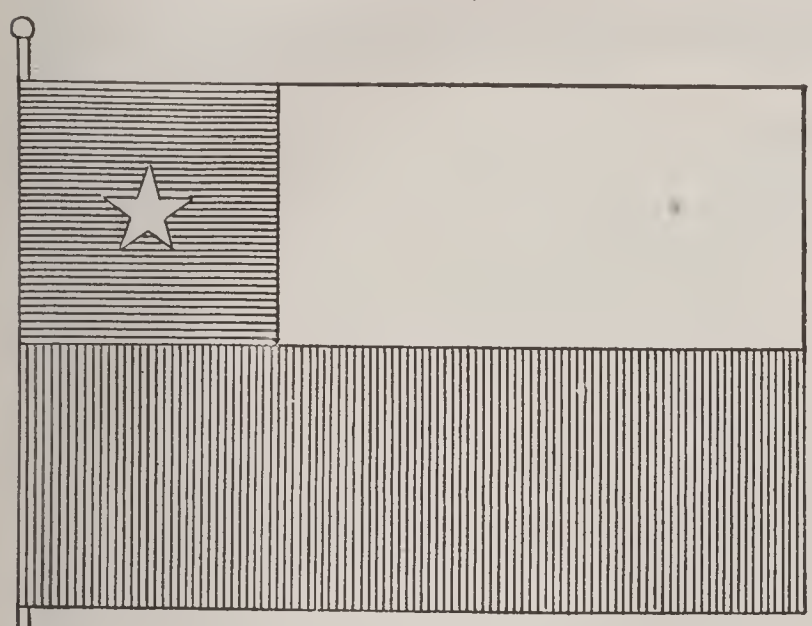
With the development of more intimate governmental and social relations will come a growth of business relations between Chileans and North Americans. Mutual confidence and esteem, the result of a closer acquaintance, will lay the foundation for mutual trade patronage for all the future.

Government and Religion. Under a constitution in many respects similar to that of the United States and adopted in 1833, the executive power is vested in a President, who is elected for a term of five years by electors chosen by popular vote. He is ineligible for reëlection for the next succeeding term. Voters must be twenty-one years old, and able to read and write. The day of the Presidential election is June 25; the inauguration, September 18. A Cabinet of six Ministers aids the President; also a Council of State, consisting of eleven members, five of whom he nominates, six being nominated by Congress.

Legislative power is vested in a National Congress, consisting of a Senate with thirty-seven members elected for a term of six years, and a Chamber of Deputies of 118 members, chosen for a period of three years. For local government, Chile is divided into provinces, which are divided into departments. Police of the capitals of departments and of Santiago, the capital of the republic, are organized by the President at the expense of the treasury.

Besides a High Court of Justice in the capital, there are seven courts of appeal through-

out the republic, Tribunals of First Instance in department capitals and smaller courts in districts. There are two central prisons, twenty-four penitentiaries, eighty other prisons, besides houses of correction, reformatories and



ENSIGN

Horizontal lines, blue; perpendicular lines, red; plain surface, white.

public hospitals, lunatic asylums, shelters and dispensaries.

Affairs of state are still largely controlled by great landholders; and the Roman Catholic Church, which is the state Church and sustained at public expense, is also powerful. Other churches, however, are tolerated.

Cities. The chief cities, which look like modern business towns, with their trolley cars and attractive shops, are the capital, Santiago; Valparaiso, the most important seaport of the west coast of South America; Concepcion, a seaport about 300 miles south of Valparaiso; Coquimbo, in the iron-ore district; Iquique, the port of export trade in the nitrate section; Nuble, Cautin, Valdivia, Aconcagua and Talca. The most important of these are described under their individual titles in these volumes.

History. The real conquest of Chile began under the direction of Valdivia in 1540. For more than two centuries the brave and intelligent Araucanians struggled against the Spanish power. The history of Chile from the successful revolution of 1817-1818, which overthrew the Spanish domination, has been for the most part orderly and progressive. San Martin and O'Higgins were the outstanding heroes of the short war for independence. The history of Chile is of interest to both Americas, for it is connected with both the northern and southern continents. The Battle of Valparaiso was a naval conflict (March 28, 1814) of the War of 1812, between the United States and Great Britain, in which Commodore David Porter's famous battleship *Essex* was destroyed by British ships outside of Valparaiso harbor.

The valuable deposits of nitrate in Northern Chile caused many boundary disputes. Beginning in 1843, the question of the Argentina boundary menaced peaceful relations, until in 1881 a treaty was signed. But even after that, rumors of war caused a disturbed condition in both countries until 1902. A remarkable statue of Christ was erected in the heart of the Andes, on the boundary between the two countries, to celebrate ultimate peace. (There is an illustration of this monument under the title ARGENTINA.)

In 1865 Chile and Peru were forced into a war with Spain; but through the intervention of the United States hostilities were ended in 1869, and peace was established in 1879. Then war commenced with Bolivia and Peru, and in that conflict the Chileans showed the excellence of their navy, which they have kept at a high standard ever since. In that war Chile added to its possessions the territories of Antofagasta and Tarapaca.

From 1833 to 1873 there were but four Presidents of Chile, and each served for two terms, or ten years. In 1873 the constitution was liberalized by amendments. In 1891 President Balmaceda opposed the Congress of the nation, was defeated in arms and committed suicide. In the same year there was a serious conflict at Valparaiso between some United States sailors and a crowd of Chileans; there was also a controversy between the governments of the two nations as to certain acts of the Chilean warship *Itata.* Both matters were adjusted diplomatically, and a spirit of friendship between the two republics has steadily grown with increasing intimacy of relations between them. Chile is one of the "A B C" powers (Argentina, Brazil and Chile) which offered to mediate in 1915 between Mexico and the United States. H.M.S.

Other Items of Interest. Chile has the southernmost city in the world—Punta Arenas.

Chile is not made up of states, as is the United States, Argentina or Brazil, but is a single state under a single government. For governmental purposes it is divided into provinces.

At least one-fourth of the territory of Chile is composed of islands. One of these, Easter Island, is more than two thousand miles from Chile, almost in the center of the Pacific Ocean.

In the southernmost part of Chile is found the remnant of a primitive race, the Yaghans.

OUTLINE AND QUESTIONS ON CHILE

Outline

I. Location

(1) Latitude, 17° 57′ to 55° 58′ 40″ south
(2) Longitude, about that of Boston
(3) Boundaries
(4) Distance from New York and London

II. Size and Form

(1) Length, 2,700 miles
(2) Average breadth, 87 miles
(3) Area
  (a) Comparative
  (b) Actual
(4) "Shoestring republic"

III. Physical Features

(1) Surface regions
  (a) Northern desert section
  (b) Central valley
  (c) Southern mountainous section
(2) The Andes
(3) Rivers

IV. Climate

(1) Sub-tropical in north
(2) Pleasant and healthful in central section
(3) The cold southern region
(4) Rainfall

V. The People

(1) Population
  (a) Actual
  (b) Comparative.
  (c) Density
(2) Natives
  (a) Origin
  (b) Characteristics
(3) Foreigners
(4) Ancient races
  (a) Araucanians
  (b) Patagonians
(5) Religion
(6) Education
  (a) Absence of compulsory education laws

VI. Industries and Transportation

(1) Mining
  (a) Nitrate of soda
  (b) Copper
  (c) Other minerals
(2) Agriculture
  (a) Location in central valley
  (b) Stock-raising
(3) Manufacturing
(4) Communication
  (a) Railroads
  (b) Rivers
  (c) Roads
  (d) Coastwise trade
  (e) Connection with other countries
    1. Influence of Panama Canal

VII. Government

(1) Republican form
(2) Departments
(3) Local government

VIII. History

(1) The conquest
(2) Independence achieved
(3) How its history has touched that of other countries in North and South America
(4) Recent progress

Questions

What might be called the "ice-houses of the Strait of Magellan"?

What metal was once mined in Chile in greater quantities than in any other country in the world?

How does the country now rank in the production of that same metal?

Why is it safer for vessels to anchor in the harbor of Valparaiso now than it was a few years ago?

What class of the population has most to do with governmental affairs?

Who were the Patagonians? Give some of their characteristics. How many of them remain?

What is the great mineral product of the desert region? What is it used for?

Outline and Questions on Chile—Continued

What distinction has this country among South American states in the matter of railway transportation?

By whom are the policemen paid in Santiago?

How large a proportion of the inhabitants of the country are European born? How many are from the South American countries to the north?

What is there in Central Park, New York, that might remind the observer of this far-away land?

How long do experts estimate that Chile's chief source of mineral wealth will last?

What connection is there between the fact that there are not a great many foreigners in Chile and the fact that Chilean manufactures are unimportant?

Under what conditions do the few surviving primitive inhabitants of the country live?

How many prisons are there in Chile?

Why are more beggars to be seen on the streets of the capital city on Saturday than on any other day?

What language does a Chilean speak?

How does the country differ in its flora and fauna from most other states of the continent?

What connection has one of Chile's outlying possessions with a famous English classic?

What attitude does the government take toward immigration?

On what date is the President elected? Does his inauguration come in the same season as does that of the President of the United States?

When did the United States intervene and bring about peace for Chile?

How does this country differ in national character from those countries colonized by Spaniards from the south of Spain?

What part of the Andes has the largest eternal snowfields?

If South America were folded over upon North America, according to latitude, how far would Chile reach?

Describe the flag of the country.

On what commodity which it imports in large quantities does the government place a protective tariff?

What resource of great value has been the cause of numerous disputes between this country and its neighbors?

How did Chile and Argentina celebrate the establishment of a lasting peace between them?

What was the probable origin of the country's name?

What resemblance is there between the far southern coast of this country and a certain far northern shore line?

Why do fewer ships call at the harbor of Valparaiso now than in former days?

Why is this known as the "shoestring republic"?

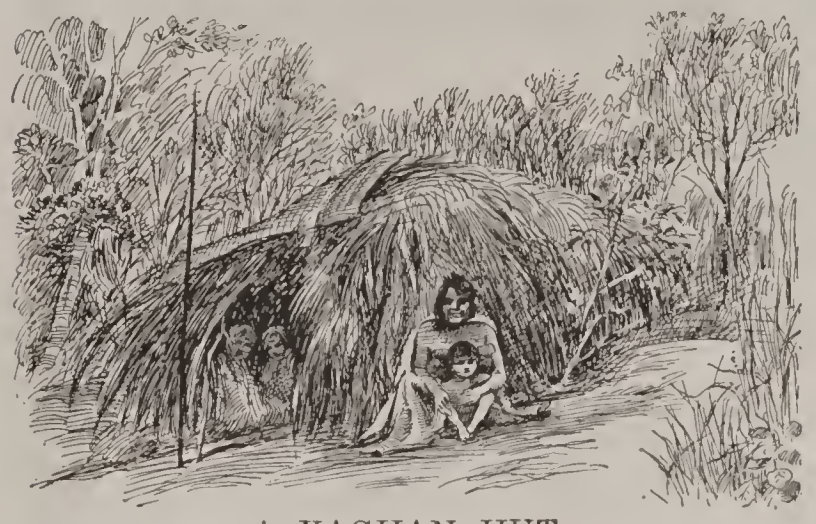
Compare the country in area and population with the Canadian province which it most closely resembles in size.

What state of the American Union is nearest it in area? How do the two compare in population?

Are there any particulars in which Central Chile may be compared with Central California? How do the two compare in latitude?

How large a proportion of the population makes its living by agriculture?

They wear no clothing, make no weapons or utensils, and live on what the sea casts up. In time of famine a Yaghan will kill his wife to feed his dogs, for he says, "Doggie catch otter, old woman no."



A YAGHAN HUT

In Central Park, New York, there stands a bronze statue of an Indian in dramatic pose. This *Last of the Mohicans,* as it is called, is the work of a Chilean sculptor, Don Nicanor Plaza.

Despite the cheapness of horses, they are little used as draft animals, oxen pulling not only the carts in the streets but the farm machinery as well. These oxen are yoked by the horns, in a way which seems to foreigners very cruel.

The country has taken some steps toward restriction of the liquor traffic in forbidding the sale of alcoholic beverages in the streets and highways and on railroad trains.

In the Strait of Magellan icebergs are numerous, and ships occasionally tie up to one to allow the crew to chop ice for the refrigerators.

Related Subjects. The following articles in these volumes will make more clear certain phases of this general subject:

Andes	Punta Arenas
Concepcion	San Martin, José de
Copper	Santiago
Horn, Cape	Sheep
Magellan, Strait of	Tierra del Fuego
Nitrate	Valparaiso
Patagonia	

Consult *Chile,* a handbook compiled by the International Bureau of American Republics, Washington, D. C.; Koebel's *Modern Chile;* Mill's *Chile.* The two last-named were published in London in 1914, and may be secured through booksellers. There are no books on the republic from American publishers.

CHILE CON CARNE, *chil'i kon kar' ni,* a Spanish dish, now popular in the United States with those who enjoy "hotly"-seasoned food. Chili, or Chilli, is the Spanish name for red peppers, and chile con carne means peppers with meat. The following is a recipe for enough to serve six or eight people:

Clean, singe, and cut in pieces for serving, two young chickens. Season with salt and pepper, and fry quickly in butter. Remove seeds and veins from eight red peppers, cover with boiling water and cook until soft. Mash and rub through a sieve. Add one teaspoonful salt, one finely-chopped onion, cloves of garlic finely chopped, and the chicken, and cover with boiling water. Cook until chicken is tender. Remove and thicken sauce with three tablespoonfuls each of butter and flour cooked together. Canned pimentos may be used in place of red peppers.

CHILLICOTHE, *chil i koth' i,* Ohio, an industrial city with a population of 14,600 in 1910, which had increased to 15,831 in 1920. About thirty per cent of the inhabitants are Germans. It is the county seat of Ross County and is situated on the right bank of the Scioto River and on the Ohio Canal, in the southern part of the state, fifty miles south of Columbus. Cincinnati is about 100 miles southwest. The city is served by the Baltimore & Ohio Southwestern, constructed to the city in 1854, the Norfolk & Western, built to that point in 1876, and the Cincinnati, Hamilton & Dayton, in operation since 1878. The Scioto Traction System has hourly service to Columbus. The area of the city is about three square miles.

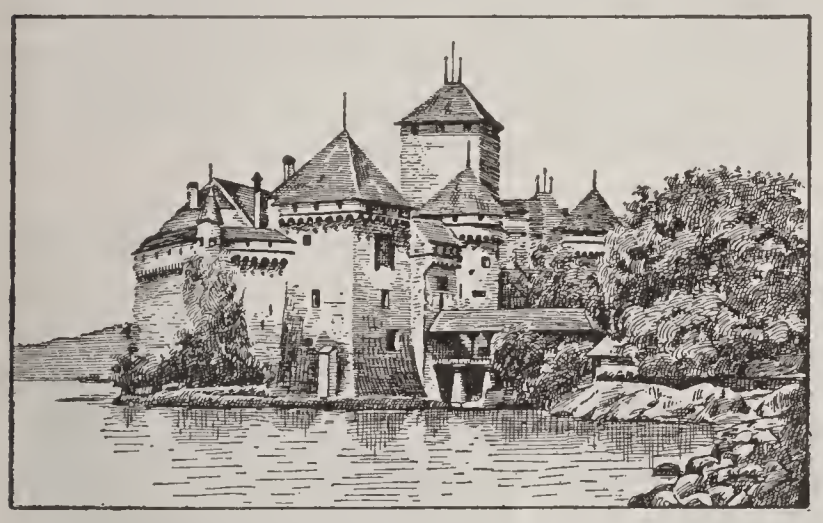
Chillicothe is situated in a rich agricultural and coal region, sheltered by hills. The district offers to manufacturers an abundance of natural gas, coal, water, clay, stone and hardwoods. The industrial establishments of Chillicothe include one of the largest canning factories in the Middle West, and the third largest cornmeal mill in the world. Automobile and shoe factories, paper mills and railroad shops are other establishments of importance. The most notable buildings are a post office, constructed in 1905 at a cost of $100,000, and a fine courthouse. There are also a Carnegie Library and a business college.

The historical events of the early years of the state's existence are associated with Chillicothe. It was founded in 1796, incorporated in 1802 and received its name from the Chillicothe tribe of Indians. It was here that General Saint Clair organized his territorial government; here was adopted a constitution for the state in November, 1802, and the next year witnessed the birth of the state and the election of Edward Tiffin as first governor. From this event until 1810 and from 1812 to 1816 Chillicothe was the capital of the state; hence the city is frequently called *The Old Capital.* Chillicothe claims to have manufactured the first sulphur matches, and to have the great-

est earthworks, in size and number, of the mound builders. J.C.A.

CHILLIWACK, B. C., a city in British Columbia, on the south bank of the Fraser River, seventy miles east of Vancouver and twenty miles north of the United States boundary. It is on the Canadian Northern Railway and is the terminus of the British Columbia Electric Railway from Vancouver, the longest electric road in Canada. Chilliwack also has connection by ferry with the Canadian Pacific Railway at Harrison Mills, across the river. The Fraser is navigable, and steamers run daily to and from New Westminster, at its mouth. Chilliwack and its vicinity are noted for the beauty of the mountain scenery and for the variety of the fruit crops. The city has a number of manufacturing establishments which indicate the principal products of the neighborhood; they are lumber, planing and shingle mills, a sash and door factory, a fruit cannery, a milk-condensing factory and two creameries with a combined output of 500,000 pounds of butter a year. Population in 1911, 1,657; in 1921, 1,767. P.J.B.

CHILLON, *shil lon'* or *she yoN',* a castle-fortress on a rock at the east end of Lake Geneva, Switzerland, reached from the mainland by a bridge. It has acquired interest from Byron's poem, *The Prisoner of Chillon,*



THE CASTLE OF CHILLON

which tells the story of Francis Bonnivard, prior of Saint Victor and Genevan patriot, who was cast into an underground dungeon of the Castle by the counts of Savoy. From 1530 to 1536 he suffered there in the cause of religion. The tale is not strictly historical.

CHIMAERA, *ki me'ra,* in the stories of Homer, a fire-breathing female monster with the head of a lion, the body of a goat and the tail of a serpent, that long laid waste the land of Lycia and Caria. The hero, Bellerophon, commissioned by the Lycian king, Iobates, to destroy this creature, procured with the help of Minerva the winged steed Pegasus, and speeding through the air, found the Chimaera and killed her.

The word *chimerical,* derived from *Chimaera,* has come to be applied to any idea or plan that is wild or fantastic.

CHIMBORAZO, *chim bo rah'zo,* an imposing mountain of the Andes, located in Ecuador, about 120 miles from the Pacific coast. Viewed from the shore it is a magnificent sight, rising 20,703 feet above the level of the sea, and perpetually snow-covered from the summit down a half mile. It is an extinct volcano, but has no crater. For a long time Chimborazo was thought to be the loftiest mountain in the world, but there are eight higher in South America; Aconcagua rises 23,080 feet above sea level. Many attempted to reach Chimborazo's snow-capped peak, called Silver Bell, before the first successful ascent was made in 1880.

CHIMNEY, *chim'ni.* A hollow tree was the first chimney of our unlettered forefathers. Accidentally set on fire, this tree illustrated the principle upon which all chimneys have been constructed. It showed that warm air, being lighter than cold air, tends to rise. When this warm air is confined within an enclosure open at the top and bottom a strong upward current fills the space. As the warm air rises the cold air rushes in through the opening at the bottom of the shaft, and in this way a draft is created which supplies the fire at the foot of the chimney with the oxygen it needs to support combustion.

Simple chimneys are constructed of logs and mortar, or of stones and mortar, such as those built for log cabins; of brick, also of cement and of iron pipes made for the purpose. Since a long column of hot air produces a stronger current than a short one, the tallest chimneys, other things being equal, produce the strongest draft. Tall chimneys are larger at the base than at the top. This is to make the structure stable and to increase the draft by contracting the flue at the top. At the bottom the chimney is usually connected with the fire by a flue. A fireplace, however, is practically an enlarged part of the chimney.

The size and height of a chimney depend upon the size of the furnace. For larger furnaces there is greater danger of making the flue too small than too large. The stacks or chimneys of the largest steamships like the *Mauritania* and the *Imperator* are so large that two railway trains could run through them

abreast, and they are about 175 feet in length. The difference between a chimney and a smoke-stack is in name only; chimneys constructed of tubing made from iron plates are usually called stacks. W.F.R.

THE CHIMPANZEE AT EASE

ITS HAND AND FOOT

CHIMPANZEE, *chim pan' zee,* or *chim pan zee',* a large manlike African ape, of the same genus as the gorilla. Its face and hands are flesh-colored, or yellowish, the teeth beautifully white, the ears very large. The body is covered with coarse, long, black hair. When full grown the animal is sometimes five feet high. It does not often stand erect, but usually supports itself in an upright position by its long forearms. A wanderer in habit, the chimpanzee lives in dense jungles, where it climbs to the tops of the trees, eating soft fruits, insects and birds' eggs. At night its loud, terrific, long-drawn cries can sometimes be heard for a mile or more. The chimpanzee has many human characteristics; it is lively, playful and quite easily tamed. The two most noted chimpanzees which have been tamed, exhibited and studied, are "Sally" of the London Zoo, and "Johanna" of Barnum and Bailey's show of 1899. Wonderful stories are told of their exploits. See APE; GORILLA.

CHINA, the largest country of Asia, and one of the oldest on the globe that still exists as a nation. Long before Rome was founded, it is believed, China was a flourishing nation, with its arts, its government and its peculiar family traditions well established. Through all the centuries until the nineteenth it remained a shrouded nation, shut off from intercourse with other peoples; even to-day it is probably the least understood of all the nations, and most of the statistics which are given for it are little more than estimates. For thousands of years a monarchy of the most absolute type, for nearly four years a republic, at least in name, then by a sharp reaction, a monarchy, then reverting to the republic again, —such has been the history of this country which is called by its own people *Chunghua,* meaning *Flower of the Middle.*

Location and Size. China comprises the southeastern part of Asia, and its area of 3,913,560 square miles comprises somewhat

more than one-fourth of that vast continent. In all the world only Russia (with Siberia) and Great Britain and France with their colonial possessions surpass it in size. No census has ever made possible a statement of the exact population, but the Chinese government in 1911 estimated it at 320,650,000—a population greater than that of any other single nation on the globe. The entire population of the British Empire is greater, but it is scattered all over the world, and is of every color, temperament and language, while that of China is compact and almost a unit as to race, language and customs.

Of this vast population over ninety-five per cent live in what is known as China proper, which comprises only about one-third of the entire Chinese republic. Between this compact southeastern portion and the other countries of Asia lie the great Chinese provinces of Tibet, Eastern Turkestan, Mongolia and Manchuria, all of which are, either in their climate or in their soil, inhospitable enough to be real barriers against invasion. These buffer states account in large measure for the degree to which China has been able to keep itself untouched by influences from the outside world. Each of them is treated under its own title in these volumes, and the present article is concerned only with China proper, unless otherwise stated.

Physical Features. In no other country is the importance of rivers more evident than in China. From the mountainous inland regions they flow to the Pacific in roughly-parallel courses, and in their fertile valleys is crowded together a large proportion of the inhabitants. Only two of these river basins—that of the Yang-tse-kiang or "Great River," and that of the Hoang-ho, or "Yellow River"—form great plains, the rest of China being largely mountainous. Both of these rivers, springing from the mountain section where snow is heavy, are subject to floods which keep the near-by lands constantly fertile, but these floods have other and less beneficial results. Sometimes they are so vast that they sweep away the wonderful works built to hold the river in its course, bring death to thousands of people in their basins, and by widespread destruction of crops cause famine through the land. The Hoang-ho, especially, which in twenty-five centuries has altered its course eleven times, is treacherous, and by its devastating floods has won for itself the name of "China's Sorrow."

In the north, west and south are mountains, those of the west being the highest. By no means all of this mountainous section is lost to cultivation, for the Chinese have shown marked ability in adapting themselves to their environment. The southeastern mountains, steep in their higher slopes, are cultivated only to a height of 2,000 feet or thereabouts, but in the north, where the valleys are filled with a

LOCATION MAP

Showing, also, the proportion of the Asiatic continent occupied by China.

peculiar fertile soil called loess, the mountains are often terraced to a height of 8,000 feet. This inland mountain region is almost unknown to travelers, except the most determined and enterprising of them, and contains none of the great cities. These, for the most part, are situated along the coast, which is 2,500 miles in extent, or on the rivers; and the rivers near a great city present a remarkably busy and crowded aspect (see illustration, CANTON).

Of lakes China has a number, though none of great size or importance. Practically all of them are near the Yang-tse, and most of them are shallow and in danger of being filled up with silt from the river floods. The Chinese are a most ingenious people, and in certain of the lakes they have fashioned artificial floating islands which are among the sights that travelers flock to see.

Climate. Nowhere is the statement that a "temperate climate is one which shows extreme heat in summer and extreme cold in winter" better illustrated than in China, for though almost the entire country lies within the north temperate zone, the extremes of heat and cold are great, except upon the seacoast. This is accounted for by the fact that it is part of a very large land mass, a "continental climate" always showing much greater variations than

does one affected by great bodies of water. In the northern part of China the average temperature for the year is about 51°; in the south, about 79°, and the annual range is twice as great in the north as in the south. The summer months throughout much of the country are very hot, while in the winter the rivers are frozen through a great part of their courses.

Most of the rainfall occurs during the summer season, but this is by no means evenly distributed over the country. In the south, near the coast, it is frequently 100 inches a year, while at Peking, in the north, it rarely reaches twenty-five inches.

Plants and Animals. As might be expected in a country of so great size, the plant life of China is widely varied. The very name associates itself in the mind with certain plants —tea, the opium poppy, the mulberry and rice; and these are widely cultivated and are treated under the heading of *Agriculture,* below. Of the plants which the Chinaman finds ready to his hand by the gift of nature, by all means the most important is the bamboo, which he could no more do without than the American or Englishman could do without iron and its products. But he uses bamboo in more ways than iron is used—he eats the young sprouts, fashions a great deal of his furniture out of the full-grown reeds, builds houses and boats in which to live and makes paper from it. The wax, camphor and varnish trees, and in the south the cocoanut and other palms, are characteristic of China, which still has in some of its mountain areas extensive forests. Over large regions, however, the forests have been cut down, and vast, desolate stretches are clothed only with a tough grass. It is not that the Chinese do not appreciate the beauty of trees—it is simply that they must use every resource at their command. Perhaps the land is capable of cultivation—then assuredly the trees must come down; if not, wood is always good for burning, and the trees must come down, anyway.

It might be surprising to learn how many of the commonly-known fruits and flowers are Chinese in origin. Not only the various species of the azalea and the rhododendron, but the peach and the orange as well, have been introduced elsewhere from China. For centuries the Chinese have had their skilled gardeners, and no Western country has brought about more wonderful developments of flowers than has China, with the chrysanthemum, for instance. But it is only the wealthy who can have flower gardens; the poorer classes have no spot of ground, however tiny, which they can spare to grow anything that cannot be eaten.

In the wild mountain regions there are still to be found tigers, leopards, bears and wolves, while in the southwestern extremity, near Burma, the elephant and the rhinoceros are frequently seen. Over much of the country, however, the large game has been driven out, but hares, rabbits, squirrels, rats and mice are everywhere abundant, and the bird family is very numerous. Almost more important than the birds, which include geese, ducks and other species used for food, are the fish, for China is one of the greatest fish countries of the world. Particularly interesting is the use made of cormorants in fishing (see CORMORANT).

Agriculture. For thousands of years the land of China has been cultivated, and during much of that time has supported a huge population, yet its fertility is not exhausted and China is still primarily an agricultural nation. This tells much about the methods that are employed. Primitive they may be, but they tend to conserve the elements of the soil. A Chinese city has no drainage system, no garbage-disposal problem. In the early morning hours, before dawn, the farmers' boats enter the canals of the city and glide here and there, collecting the refuse of every sort for fertilizing purposes.

Farming is held in high honor, and in the days of the Empire it was the custom each year for the emperor to open the agricultural season by turning a furrow and sowing some seed. The government really owns the land, and has a right to eject any man from his holding if he does not till it carefully. Most of these holdings are small, comparatively few being over ten acres, but from these little patches excellent returns are received—excellent, that is, from the viewpoint of the Chinese, who do not demand much beyond the necessities of life. No patch of ground is too small to claim attention. If a man has in his holding a rocky ledge, however small, which is level enough to retain earth, he will carry earth in a basket, cover the ledge and there set out his plants. Travelers in China tell of seeing such carefully-cultivated ledges containing nineteen rice plants, the entire plot so small that it might be covered by a dinner napkin.

Nor are these their only space economies. Large rafts are built, covered with earth and moored in the river. There the farmer plants

his seed in early spring, and as the raft drifts slowly down the river the crops grow and ripen. The picture is an attractive one to a person who has not seen the original, and gives the impression of a lazy, luxurious people who cannot even stay at home to grow their crops. But the truth is far otherwise. The Chinese peasant is the hardest-working man in the world, and only dire necessity of finding a place to live and grow the things he needs for food forces him into such expedients. Hundreds of thousands of Chinese live on river boats, and have no other homes (see *Commerce and Transportation,* page 1344).

One of the most interesting sections is the hill country, for the hillsides are graded into terraces and present the appearance of gardens of variegated green. Much of the beauty is lost, however, with sober reflection on the

COMPARATIVE AREAS
China and the United States drawn to the same scale.

amount of incredible, heart-breaking labor necessary to turn these slopes into tillable fields. Water for irrigation is raised to these higher levels from the streams by a system of water wheels with buckets, the necessary power being furnished by men or by the Asiatic buffalo. The first water wheel lifts the water to a canal on the first level, the second to the next level, and so on till the highest point has been reached, and every drop of water is made to do its full work in its descent. Wonderful indeed is the system of canals which this industrious people have constructed to maintain the fertility of their fields and to control the waters of the raging rivers so that they may not do too great damage. A careful student of Oriental countries declares:

> Forty canals across the United States from east to west and sixty from north to south would not equal in number of miles those in China, Korea and Japan. Indeed, it is probable that this estimate is not too large for China alone.

Of course these canals are not all for irrigation or water control; some, notably the Grand Canal, from Hang-chow to Tien-tsin, are primarily ship canals, but many serve all purposes.

Chief Crops. China is especially fortunate in the fact that the warm season and the rainy season fall together, for that fact makes possible the raising of sub-tropical crops which could not otherwise be grown in that latitude. First and foremost of the crops is rice, the staple food of the people, which is grown chiefly in the middle and southeastern sections. The vast rice fields of this region, with their vivid green and the standing water between the rows, are extremely picturesque. Tea, which is also grown chiefly in the south; the mulberry, cultivated as food for the silkworm; cotton, tobacco, sugar cane, indigo and vegetables are other crops of importance, while wheat, corn and oats are produced in considerable quantities. Formerly one of the widely-cultivated plants was the poppy, which yields the opium that has been China's chief curse. In 1906, however, when the government had been brought to realize the harm opium was doing the people, provision was made for gradually reducing the amount of land under poppies, and to-day the cultivation of these beautiful but pernicious flowers has almost ceased.

Of one phase of agriculture China knows nothing, and that is stock-raising. Pigs and chickens may be seen, for they can subsist on refuse and live in the dooryard of the little thatched mud hut which shelters the family. But cows, sheep and horses must have grazing land, and land is too valuable to be used for such purposes. There are no grassy commons on which the cows of the villagers may be tethered; no roadside stretches where they may crop the weeds, for every spot is under cultivation. The effects of this lack of animals are many. Not only do the people have little meat to eat, but they know nothing of milk or of butter. And even more serious is the absence of draft animals, for it means that men must pull the carriages and bear the heavy burdens, thereby injuring their health and shortening their lives. A Chinese coolie can do draft work more swiftly and more easily than could an American or a European, but

after all he is a man and not a horse, and he inevitably pays the penalty with relatively-short life for the too-hard work which is laid upon him.

Manufactures. That the Chinese are not behind other races in their inventive faculty is proven by the fact that they were the first to use gunpowder, paper, silk, movable blocks for printing, porcelain, the magnetic needle and many other things which were later introduced into Europe or independently discovered there. But in the later centuries the inventive faculty has been hampered by the conservatism and ancestor worship so characteristic of China. No premium is placed on the discovery of new and simpler methods—the acceptable thing is to carry on a process just as it has been carried on in ages past. Thus it happens that the Chinese have been slow to introduce machinery and that many of their products continue to be made in the homes of the people or in very small establishments. Even so, their silk is better than any made elsewhere, while their embroideries are marvels of beauty and skill.

Gold and silver filigree work, lacquer ware, wood and ivory carving and bronze casting show not only the remarkable ability of the people, but their artistic sense as well. Of recent years more and more machinery has been introduced and some of the old hand work, as the most intricate embroidering and carving, has been forbidden by law because of its bad effect on the eyes. Certain students of economic questions have expressed the fear that the time may come when Chinese factories will be able to produce goods so cheaply that American and European products cannot compete with them, for the Chinese laborer is content with a wage incredibly lower than that of the Western workman. For reeling silk for eleven hours in the factories women get from eight to eleven cents a day, and workers at almost any trade may be secured by the thousands for a like wage.

Important Mineral Resources. That mineral deposits are enormous has long been known, but the research made has not been thorough enough to determine their exact extent. Of chief importance is coal, of which the largest field in the world, so far as known, exists in the province of Shan-si in the Hoang-ho basin. This is anthracite (hard coal) of high quality, and near it is a great bed of bituminous (soft) coal. Iron, too, occurs in great quantities, some of it so near the coal fields that considerable iron industries have sprung up, but mining, like most of the other industries of China, has never reached a high stage of development because of lack of transportation facilities. If metals exist near the great waterways, well and good—they can be transported with ease and widely used; if not, they are of service only in the sections in which they are found. Apparently inexhaustible beds of kaolin, or porcelain clay, early gave rise to the china-making industry, and this clay still forms one of the most valuable mineral resources. Some gold, silver, copper and lead are mined by primitive or surface methods, but how rich the deposits may be has never been determined.

Commerce and Transportation. Though China has long had commercial relations with foreign countries, it was only after the opening of the treaty ports in 1842 that its foreign commerce became extensive. To-day its foreign trade amounts to about $625,000,000 annually, the imports making up rather more than half that amount. By far the largest exports are silk, raw and manufactured, while cotton and cotton goods constitute the chief imports. Everywhere in China are to be seen the blue cotton garments of the people, and it is estimated that the amount of cotton goods used each year in the country would carpet a roadway sixty feet wide from the earth to the moon. It is slight wonder that over $100,000,000 worth of cotton goods must go into the country annually. The foreign trade is carried on in forty-eight cities known as treaty ports, some of them on the coast, some hundreds of miles inland on the great rivers.

Of the vast interior trade of China it is impossible to make even a fair estimate, and it is carried on under difficulties. In the well-settled parts of the country there are many roads, built centuries ago, but these are in very bad condition, for the Chinese expend no energy in repairing them. Some of the towns have paved streets, but out on the plains and between the villages, especially in the rice zone, the farmers have gradually encroached upon the roads until to-day mere footpaths are left, wide enough for a man with a pack or with wheelbarrow, but not for vehicles.

Railway-building has made but comparatively slight headway, for the government from the first set itself strongly against it. The people, too, objected, for the desired right of way often ran through graveyards, and to desecrate a grave is to the Chinese the height of impiety. But every line of railway built has proved its value so conclusively that construc-

tion is now going forward rapidly. Around the big cities railroads are especially numerous, and it is estimated that there are in the country about 8,000 miles—fewer miles for China's 320,650,000 people than for the nearly 6,500,000 of little Illinois.

But the great highways of China are the rivers and canals, of which there is a network all over the country. On all the large rivers, but especially on the Yang-tse, the volume of trade has steadily increased

Threshing Grain

desired during the cold and the rainy seasons.

The People and Their Mode of Life. The Chinese are a Mongolian people, with the yellowish skin, straight black hair, obliquely-set almond-shaped eyes and high cheek bones characteristic of that race. In general they are of rather low stature and have small hands and feet, but variations in physical structure are to be seen in the different parts of the country. Many of their moral qualities are excellent.

Rural Flour Mill

until the waterways literally swarm with boats, junks and barges of all sizes. Probably there are as many boats in China as in all the rest of the world together. Thousands and thousands of people pass their lives in houseboats or sampans, and great stretches of the rivers are so crowded with these along the shore that no water shows between. These are not luxurious houseboats, but tiny cabins of one small room, which are satisfactory enough in good weather, but leave much to be

Winnowing Grain

For example, they are unusually industrious and toil constantly for the support of their families; they are strongly attached to their homes; they hold age in great respect, and while they are not as a race decidedly trustworthy in dealing with white people, they are capable of loyalty to the point of martyrdom. Gambling is almost universal among them, and opium-smoking was long a dreadful curse, but it has been decidedly lessened through the efforts of the government

Overcrowding. One thing may be said about the Chinese people very positively—there are too many of them for the amount of land they possess. Almost every locality which will sustain life is crowded to its limit; every natural resource is exhausted in trying to feed the teeming population. Nor do the Chinese, much as they suffer from this overcrowding, and barren as are their lives of every comfort, see any way out of the difficulty. Marriage is universal and takes place at a far earlier average age than in any American or European country, nor must a youth wait until he can support a wife. He simply brings her home to his father's house, and there she has her share, meager enough in the case of the poor, of the family rice. Families are large, for the number of his sons is the thing upon which a man most prides himself. And so long as the social system remains as it is, so long as China is "ruled more from the cemetery than from the palace," men will desire sons to live after them and honor them, and population will know no decrease save that of a high death rate.

Position of Women. In general, the men and women of the household are kept strictly separate. The women are held to be much inferior to the men, and have practically no social advantages. Not one in a hundred after marriage travels a mile from the house to which she was brought as a bride. In part, this is because it is so difficult for them to walk, owing to their bound feet. A Chinaman has always believed a woman hideous unless she has tiny feet, and lest a girl may not find a husband her parents bind her feet while she is but a child, crushing the bones, bending the toes under, and crippling her for life. This takes place not only among the wealthy and fashionable, but among all classes, and even the poor women who must earn their living in the fields have often to crawl about their work because they cannot walk. But there has been a decided lessening in this cruel practice, owing largely to the efforts of foreign women, and now in the cities and among the higher classes it is seldom resorted to. The day is not far distant when foot-binding will be rare, except far in the interior of the country.

What the Chinese Eat. It is a common saying that a Chinese family could live on what an American family would not eat, and while it may not be literally true, it is most suggestive of the real condition of the people. Prof. E. A. Ross, author of *The Changing Chinese,* puts it graphically:

> The sea is raked and strained for edible plunder. Seaweed and kelp have a place in the larder. Great quantities of shellfish no bigger than one's finger nail are opened and made to yield a food that finds its way far inland. The fungus that springs up in the grass after a rain is eaten. Fried sweet potato vines furnish the poor man's table. The roadside ditches are bailed out for the sake of fishes no longer than one's finger. * * * The silkworms are eaten after the cocoon has been unwound from them. After their work is done horses, donkeys, mules and camels become butcher's meat. The cow or pig that has died a natural death is not disdained. * * * In Canton rats and cats are exposed for sale.

Tea is the universal drink, taken not with the meal, but just as water is drunk elsewhere. Nor is a love for tea the only reason for this large consumption. Where people are so crowded together and all care for sanitation is lacking, only boiled water is safe for drinking, and this the tea makes palatable.

Language and Education. The Chinese language has no alphabet, for it is not a *letter* but a *syllable* language. Each written character represents not a sound but a word of one syllable, for no Chinese word has more. Thus a Chinese child learning to read must learn not twenty-six letters, as in English, but characters standing for every word he ever hopes to use. Out of the 44,449 word-characters contained in the dictionaries, however, even a well-educated man needs fewer than 3,000. As the same word may stand for a number of different ideas, according to its position in the sentence, and as each sound may be pronounced in a number of different tones, each of which has a different meaning, the language is one of the most difficult in the world for a foreigner to master. When written, the characters are placed in columns, not in lines, and are read from top to bottom.

Education is held in high honor among the Chinese, but their ideas as to what constitutes education are steadily changing. In the old China, before it became tinged with the notions of Western peoples, there was a special class which devoted itself to study, with the object of passing the examinations which alone could admit to public office. These examinations were held throughout the country at stated times, and concerned themselves only with literature and philosophy—subjects which did not necessarily fit men to discharge their official duties well.

In 1905, however, the old formal examinations were abolished, and strenuous efforts are being made to introduce a system of education

BRIDAL ARRAY. In China children are given in marriage at the age of ten. The wedding clothes of the rich are marvelously beautiful.

on a Western basis. Primary and secondary schools have been established, grading up to institutions of higher learning, the whole system culminating in Peking University. As yet, however, education is by no means widespread. Millions of grown men have either no knowledge of reading and writing, or just enough for actual necessities of life. Only of late years have the Chinese been brought to look upon women in general as important enough to deserve even to know how to read, but women of the better classes were taught to read and write even in old China.

Religion. Religion plays a great part in the life of the Chinese, but it is a religion of superstition rather than of spiritual appeal. Temples are numerous, shrines are in every house, but fear of demons and not love of deity is the dominant feeling. Mohammedanism has made about 20,000,000 converts, Christianity fewer than 1,500,000, and the rest of the people profess Taoism, Buddhism, Confucianism, or a mixture of the three. In 1914 a strong effort was made to adopt the last-named as the state religion, but the attempt failed. Each of these faiths is treated in these volumes in a separate article, and here it is necessary merely to state their effects upon the people. Ancestor-worship, growing out of Confucianism, is the controlling factor in Chinese life. It has led to lack of progressiveness, for only those things which were done in ancestral times are honorable; to the low position of women, since a daughter cannot offer up the prayers and offerings on which the happiness of a dead parent depends; and, as pointed out above, to the too-rapid growth of population.

Government. The constitution under which China is governed was promulgated on May 1, 1914, to take the place of the first provisional constitution of the republic, adopted in 1912 (see subtitle *History,* below). At the head of the government are a President and Vice-President, elected for five-year terms and eligible for reëlection. The President is granted extensive powers, for he may convoke the Legislature, and open, prorogue and close its sessions; he may initiate legislation or issue special ordinances at critical times which will be legally effective. He is chief of the army and navy and is vested with important treaty-making powers. Executive authority under the President is vested in a Secretary of State, who is assisted by nine department heads—of foreign affairs, interior, finance, war, navy, justice, education, commerce and communications. These department heads are recommended by the Secretary of State, who is himself appointed by the President. There is no Cabinet, as Western nations understand the term, and consequently no responsible government.

A Parliament, or Legislature, consisting of two houses, was authorized by the first Provisional Parliament. This Legislature could not agree with the President, and he accordingly expelled enough of its members to make a quorum impossible. In January, 1914, the suspended Parliament was dissolved by Presidential mandate. Its place has been taken by a Council of State, whose members, varying in number from fifty to seventy, are appointed by the President. This body has advisory, administrative and legislative functions, and is to be continued in all these activities until the formation and election of a future Parliament of one house. At that time it will relinquish its law-making functions. For determining finally a permanent constitution for China, it is provided that the Council of State appoint a committee of ten to draft such a constitution. When this has been approved by the Council it will be submitted for final adoption to a national assembly. Each province is governed by a governor-general, who, with his assistants, has direct control over internal provincial affairs, industries and education. The underlying principle of the government as now constituted is that every part of the country shall be subordinate to the central authority at Peking.

History of China

The Chinese claim for themselves a history that reaches back for fifty centuries or more, and the closest student can find nothing that absolutely denies the possibility of this. There are, however, no monuments or pyramids, as in Egypt, to prove conclusively the antiquity of the nation, and not until about 1125 B. C. can their history be regarded as really authentic. Confucius, it is true, begins his record with an emperor who is supposed to have reigned from 2357 to 2206 B. C., but Confucius took his statement from earlier records which were far from being historically accurate.

Early Historical Period. With the Chow dynasty, which began to reign in 1122 B. C., better times dawned for the country. The

GREAT WALL OF CHINA

This is the most colossal line of defense in the world, a wall over 1,500 miles long, extending between Mongolia and China proper, with an extension northeastward to the Sungari River. It is called in Mongolian the *White Wall,* and in Chinese *The Wall of 10,000 Li.* In the third century B. C. a crude earthwork was erected against the inroads of the Tartars; this was supplemented by the present wall, which recent investigations establish as dating only from the latter part of the fourteenth century. The structure is about twenty-two feet high, and twenty feet broad, with towers at intervals of a few hundred yards. The immensity of this engineering feat impresses one when it is realized that the wall is as long as from New York City to Omaha, or from the city of Quebec to Winnipeg. It is built of brick or dressed granite shell, filled with earth and covered with a very hard coating of bricks in lime. It follows a winding course over mountains and through valleys, and is still in a fair state of preservation for hundreds of miles. At a point near Kalzan it has been cut through to admit the railway line from Peking.

people changed from the wandering or nomadic life to a settled existence, and began that careful cultivation of the soil which has gone on unbrokenly until to-day. A feudal system grew up, the great land-holders acquiring fiefs so large that they were practically separate states, and thus China became in effect a confederation rather than an empire in the true sense of the word. The emperor, however, remained the real head, politically as well as religiously. The first date that is known with accuracy in Chinese history is during this Chow dynasty—August 29, 776 B. C., according to Western chronology; for on that day occurred an eclipse, the account of which a Chinese poet preserved. The great feudal states, each jealous of its rivals, kept up a constant strife which so disturbed the empire that finally, in the third century B. C., the Chow dynasty was overthrown by the Tsin, or Chin, dynasty, from which China takes its name.

Though this dynasty ruled for less than half a century, it accomplished certain notable things. The Great Wall of China, which is the most stupendous structure ever built by man, was erected to keep out the Tartars, and the feudal system was abolished. The emperor who performed this latter service was so anxious that his own reign should go down in history as the beginning of the empire, and especially that none of the feudal heroes should be kept in mind, that he had all the literature dealing with previous ages destroyed, and put to death hundreds of learned men. After the overthrow of the Tsin rulers dynasty after dynasty reigned, some of them doing much for the country, others fomenting strife and bloodshed. There were ages of invention, ages of literary activity, and occasional dealings with outside countries, as Japan, Persia and Korea. Through them all, however, China was crystallizing into the conservative, tradition-loving nation, which, to a large extent, it still remains. Printing was invented in the tenth century A. D., and the practice of binding the feet of women was introduced about the same time.

But a great change was coming to China. In the thirteenth century the Mongols swept over the country under Genghis Khan (which see), and under Kublai Khan, grandson of that conqueror, established a firm rule. Never before had China known such prosperity and splendor as it knew then. Marco Polo, a Venetian traveler who visited China, or as he called it, Cathay, brought back glowing accounts of its high civilization, and Italy established certain commercial relations with its merchants (see POLO, MARCO). The Mongol dynasty, never popular with the Chinese, was overthrown in 1368 by the Ming dynasty, which reigned for almost 300 years, and permitted the Portuguese and Spanish traders to enter the country and settle at its ports.

Early Modern Period. During the latter part of the Ming rule rebellion was rife, the very throne being menaced, and finally, in 1643, the Manchus were invited into the country to establish order and to ward off the attacks of the Tartars. Their object accomplished, the Manchus refused to leave the country, but took Peking, proclaimed a Manchu prince emperor, and founded the last royal dynasty of China, which continued nearly 300 years, until the formation of the republic. For a time the Chinese refused to submit, but opposition gradually died out, and the conquerors were merged with the original inhabitants of the country. One sign there was of the subjection of the Chinese—they were forced to adopt and to wear continually the *queue,* or "pigtail," introduced by the Manchus. For two centuries internal progress went on slowly, as progress has always taken place in China, and still the outside world knew little of the great nation with its strange mixture of advanced civilization and hatred of anything new. Unable entirely to avoid trade relations with Europe and America, the Chinese submitted to them as little as possible, and made it difficult and even dangerous for "foreign devils" to enter the country. But the Western nations were not prepared to submit tamely to the regulations which restricted their trade, and before the middle of the nineteenth century they had begun to show China that a change in attitude was expedient.

Increased Intercourse with the World. Unfortunately for the credit of the European nations, the first sharp dispute with China was over the opium question. Late in the eighteenth century opium traffic had been by the Chinese government declared illegal, but the decrees were not really enforced until 1839, and then the attempts at enforcement met with protest from the British government. For the opium trade was worth millions of dollars annually to Great Britain and could not lightly be relinquished. Finally, in 1840, actual war broke out, and at its close China was compelled to surrender the island of Hong-kong, pay an indemnity of $21,000,000 and open to British trade five of its chief ports. The treaty made no mention of the opium trade. Two years later the United States and France also made trade treaties with China. In 1856 China again roused the wrath of Great Britain by refusing to apologize for the seizure of a Chinese boat flying the British flag, and again war resulted. With France as its ally, Great Britain actually took Peking, and in 1860 secured by the treaty of peace increased trading privileges and the promise of toleration for the Christian religion.

In the meantime China had been disturbed by a severe rebellion, which had grown out of the attempt of a half-mad fanatic schoolmaster to overthrow the Manchu dynasty and establish himself as the Heaven-sent head of the nation. Everybody who had a grievance flocked to his standard, and by 1853 the rebellion had reached great dimensions, Nanking having been seized as a capital and Hung-siu-tseuen proclaimed as the head of the Peace dynasty. From his watchword, *Ping,* or *peace,* and the word *tai,* or *great,* this upheaval is known as the Tai-Ping Rebellion. The Chinese government was unable to cope with it, but a small army consisting chiefly of Chinese under Charles George Gordon, or "Chinese" Gordon (which see), soon stamped it out.

Relations with Japan. Korea was always a debatable ground between China and Japan, and the difficulties concerning it in 1894 brought about open war between the two powers (see JAPAN, subtitle *History*). From the first Japan had the upper hand, and after a complete victory was able to wrest from China a treaty guaranteeing Korean independence, giving up to Japan the island of Formosa and the Liao-tung Peninsula with the strong fort of Port Arthur, and promising a huge indemnity. Foreign powers intervened and made Japan relinquish much of its gains, but they also used the opportunity to secure from China increased commercial privileges, and it became evident that their aggressions were likely to go beyond this.

The Era of Internal Reform. Sadly weak-

OUTLINE AND QUESTIONS ON CHINA

Outline

I. Location

(1) Latitude, 18° 50′ to 53° 25′ north
(2) Longitude, 74° to 135° east
(3) Relation to other countries

II. Size

(1) Greatest length, east to west, 3,000 miles
(2) Greatest breadth, 2,400 miles
(3) Actual area, 4,376,400 square miles
(4) Comparative area
    (a) Larger than all of Europe
    (b) Compared with Canada and United States
(5) Distinction between Chinese Republic and China Proper

III. Surface and Drainage

(1) Mountainous sections
    (a) Cultivation
(2) River basins
    (a) Parallel course
    (b) The two great rivers, the Yang-tse-kiang and the Hoang-ho
(3) Destructiveness of rivers
(4) Lakes
    (a) Floating island

IV. Climate

(1) Extremes of heat and cold
(2) Variations in temperature
(3) Rainfall
    (a) Uneven distribution

V. Vegetable and Animal Life

(1) Best-known plants
(2) Importance of bamboo
(3) Forest areas
(4) Absence of trees in certain localities
(5) Fruits and flowers of Chinese origin
(6) Game animals
(7) Birds
(8) Fish

VI. Industries

(1) Agriculture
    (a) Fertilization of soil
    (b) Irrigation
    (c) Intensive methods
    (d) Cultivation of hill country
    (e) Floating farms
    (f) Crops
        1. Rice
        2. Tea
        3. Mulberry
        4. Other plants
    (g) Absence of stock-growing
(2) Fishing
(3) Manufacturing
    (a) Reluctance to introduce machinery
    (b) Industries in the home
(4) Mining
    (a) Coal
    (b) Iron
    (c) Kaolin
    (d) Other minerals

VII. Communication

(1) Navigable rivers
(2) Canals
(3) Railroads
(4) Roads
(5) Commerce

VIII. The People

(1) Physical and mental characteristics
(2) Population
    (a) Overcrowding
        1. Causes
        2. Effects
(3) Manner of life
    (a) Position of women
    (b) Food
(4) Language
    (a) A "syllable," not an "alphabet" language
    (b) Written language
(5) Education
    (a) Old style
    (b) New Style
    (c) Education of women
(6) Religion
    (a) The dominant faiths
    (b) Effects of ancestor-worship

IX. Government

(1) Republican form
(2) Extensive powers of President
(3) The legislature
(4) Local government

X. History

(1) Antiquity
(2) Early historic times
(3) Mongol invasion
(4) The coming of the Manchus
(5) The opening up of China to the outside world
(6) The Chinese-Japanese War
(7) Reform demands
(8) The establishment of the republic
(9) Later disturbances

Questions

Why does the climate exhibit greater extremes than would that of an island in the same latitude?

How do the Chinese manage to produce crops on arid hillsides?

What relation is there between the Chinese reverence for ancestors and the scarcity of railways in the country?

Which has the easier task in learning to read, a Chinese schoolboy or an English schoolboy? Why?

With what science is the first really authentic date in Chinese history connected?

What is meant by the term "Boxer," and what did the Boxer Rebellion hope to accomplish?

How is it possible that some day China will have no lakes?

What are the "floating farms"? Why are they necessary?

What effect has the overcrowding of the country had on the roads in country districts?

What does a Chinaman mean when he speaks of "golden lilies"? Of "a little insect"?

Why is tea drunk so widely and so copiously?

What third country was the occasion for war between China and Japan?

To what height are the northern mountains terraced and cultivated?

How is the garbage-disposal problem solved in a Chinese city? What effect has this on agriculture?

What is "pidgin-English"? Give an example.

Why would you not care to eat with a Chinese family of the poorest class?

Does the government resemble that of Canada or that of the United States in the relative amount of power delegated to the central government and to the individual provinces or states?

Why was Charles George Gordon known as "Chinese" Gordon?

What is "China's Sorrow"? Why is it so called?

Of what bird do the people make use in one of their important industries?

What has been the chief curse of the women of China?

How did Great Britain gain possession of Hong-kong?

Why was the country able to keep itself shut up, away from intercourse with other peoples, for so long a time?

Name two fruits, very familiar in North America, which originated in this Oriental land.

Why is the extremely fine, elaborate embroidery no longer made?

What has religion to do with the overcrowding in China?

How does ancestor-worship result in the low position of women?

How and when did a mode of hair-dressing become a symbol of subjection?

How does China rank as to size among the countries of the world? As to population?

Name four ways in which the Chinese would miss the bamboo if they were deprived of it.

Why are there almost no cows or horses to be seen throughout the country?

What great curse of the people has the government undertaken to abolish?

What does religion chiefly mean to the Chinese?

What do the Chinese call their country?

What was the object of the famous examinations to which Chinese students were formerly subjected?

ened by the war with Japan, China stood in need of thorough and immediate reform, but how this was to be secured remained uncertain. For a time it looked as though the young emperor, Kwang-su, with the aid of the reform party, might bring China into closer relationship with other nations and reorganize it according to European standards, but the reactionary influence of his aunt, the empress dowager, was too strong. Gradually she drew almost all the power into her own hands, and violent anti-foreign demonstrations were the immediate result. These culminated in the famous Boxer Rebellion (which see), tacitly encouraged, at least, by the empress dowager. Even the empress dowager could not fail to derive some lesson from the disastrous effects of this rising and the attitude of the powers toward it; for the rest of her life she adopted a different attitude. No longer could a man purchase court favor by attacking foreigners; indeed, these hated intruders were actually received at court, breaking a precedent that had existed since the foundation of the government.

But the need for reform was greater than ever, and wise statesmen began to see and declare the necessity of introducing Western methods. Somehow, just how is not clear, a new national spirit was awakened, and public opinion began to demand constitutional reform. The absolute monarchy which had served for forty centuries no longer satisfied, and at length a commission was appointed to study the representative forms of government in foreign countries with a view to determining the one best fitted for China. In 1908 an edict signed by Emperor Kwang-su outlined a constitution and promised a parliamentary government within nine years; but this was too slow to suit the public demands, and when, later in the same year, the emperor and the empress dowager both died and the infant Pu-yi succeeded, discontent became outspoken. The provinces elected assemblies in 1909, and two years later the government, which had been forced to submit to the establishment of a responsible ministry, promised a Parliament in 1913.

But a radical element which had grown up among the reformers refused to be satisfied with any such half-way measures, and demanded the abdication of the emperor and the establishment of a republic. Rioting and later organized revolution resulted, and the revolutionists spurned the suggestions of Yuan Shi-Kai, newly-appointed premier, for a constitutional monarchy. With Shanghai, Nanking, Hankow and other cities in their hands, with Canton a self-proclaimed republic and one province after another declaring its independence, the revolutionists were able to enforce their demands and bring about the organization, in December, 1911, of a provisional republican government. Dr. Sun Yat Sen was elected provisional President, and the child emperor was compelled to abdicate. In February of the following year Yuan Shi-Kai was elected first President, with powers to organize the republic, and it seemed that China had given up forever its monarchy.

The Republic. The position of the new President was by no means entirely pleasant, for the lack of money was a very serious embarrassment, and only with the greatest difficulty was a loan of $125,000,000 secured from five of the great powers. Yuan's method of securing this, without the consent of his Parliament, roused violent opposition, and a sharp rebellion headed by Sun Yat Sen was put down with some difficulty.

The republic had been established, seemingly, too suddenly; the people were not ready for it after their centuries under absolutism, and they failed to grasp many of its main principles. In fact, while a republic in name, the new government was practically a monarchy, and attempts of a parliamentary party to take the power into its own hands and make of the President a mere figure-head led in the end to a large increase in Yuan's power. Finally, in November, 1915, an election was held by a specially-constituted convention of "electors." The result was overwhelmingly in favor of restored monarchical government, but the empire was not proclaimed at once because the European powers convinced China that such change during the great European war might endanger the peace of the Orient. It was finally decided to continue the republican form of government. In June, 1916, President Yuan Shi-Kai died and was succeeded by Vice-President Li Yuan Hung.

China remained neutral in the War of the Nations until 1917, although its aid had been volunteered earlier. Inspired, however, by the moral example of the United States in its declaration of a state of war, the Chinese republic declared war on Germany on August 14 of that year. The country sent no troops to Europe, but many thousand Chinese laborers went to France and labored with zeal, thus releasing an

equal number of white men for the fighting fronts.

Under persuasion and threats from Japan to withdraw from the peace conference in 1919, the treaty of peace gave to Japan occupation and virtual ownership of the Shantung peninsula of China, where live 40,000,000 Chinamen. This section had for a number of years been dominated by Germany. Chinese envoys at the Versailles peace table refused to sign the treaty containing that provision, but the conference retained it. The United States Senate announced its objection to Japan's plans; in the armament conference at Washington (1921-1922) Shantung was given back to China. See WAR OF THE NATIONS. Y.T.T.

Other Items of Interest. It took fifty years of effort on the part of all the missionaries in China to win the first thousand converts, but by 1922 it was not an unknown thing for that many "seekers" to be enrolled in a single night in one city.

When a man speaks of his wife he usually applies to her some such title as "the thorn in my flesh," and his children he calls "insects," but this latter term implies no such insult as the former.

In most of the cities where there is a large population of English, there is in use a curious mixed speech known as "pidgin-English." The term *pidgin* is a corruption of *business,* for the language grew out of the attempt of merchants and customers to understand each other. Such expressions as *chow* for *food; chop chop* for *be lively; makee* for *all right,* and *piecee* for *article* are examples of pidgin-English.

The bound feet of the Chinese women, which to foreigners seem a most cruel deformity, are called in the native tongue "the golden lilies."

Consult Ross's *The Changing Chinese;* Selby's *The Chinaman at Home;* Koo's *The Status of Aliens in China;* Mahan's *The Problem of Asia.*

Related Subjects. The following classified list will simplify reference to articles in these volumes which relate to China:

CITIES AND TOWNS

Amoy
Canton
Fu-chow
Hang-chow
Hankow
Hong-kong
Kiao-chau
Mukden
Nanking
Ning-po
Peking
Shanghai
Tien-tsin

HISTORY

Boxer Rebellion
Chinese Exclusion
Chinese-Japanese War

ISLANDS

Hong-kong

LEADING PRODUCTS

Bamboo
Coal
Cotton
Indigo
Iron
Kaolin
Mulberry
Opium
Poppy
Rice
Silk
Sugar Cane
Tea
Tobacco

MOUNTAINS

Altai
Himalaya

POLITICAL DIVISIONS

Manchuria
Mongolia
Tibet
Turkestan

RELIGIONS

Buddhism
Christianity
Confucianism
Mohammedanism
Taoism

RIVERS

Amur
Hoang-ho
Mekong
Si-kiang
Yalu
Yang-tse-kiang

CHINA PAINTING. The fascinating art of decorating china is a handicraft that makes its appeal not only to amateurs who take it up as a pleasant and interesting pastime, but likewise to those professionals who must make their time and talents bring them actual money returns. In recent years its popularity has been steadily increasing. This development has been due in part to the great advance made in materials and firing facilities, and in part to the present vogue for the conventional in design, which has made it possible for very acceptable work to be done even by those unskilled in freehand drawing.

Special Paints for China. The pigments used in china painting are called *mineral paints,* because their bases are metals; and they are said to be *vitrifiable,* which means that in the intense heat of the kiln they will fuse—that is, attach themselves to the glaze of the china—and thus become an inseparable part of it. They come both in powdered form, contained in small bottles, and as a prepared paint put up in collapsible tubes. The latter are more convenient, since they need only to be diluted with spirits of turpentine as used; but as they tend to grow hard in the tube, they are not so economical as the powdered paints, which are good indefinitely. On the other hand, experience is required to prepare the powdered colors properly, for too much oil not only attracts the dust that is everywhere in the air, but may cause blistering and "bubbling" when the china undergoes the kiln test.

Before applying the paint to the china the brush is dipped lightly into what is called the *medium,* in order that the color may be

smoothly worked. This medium is usually spirits of turpentine, although many painters prefer clove-oil, oil of lavender, tar-oil, balsam of copaiba, or aniseed-oil.

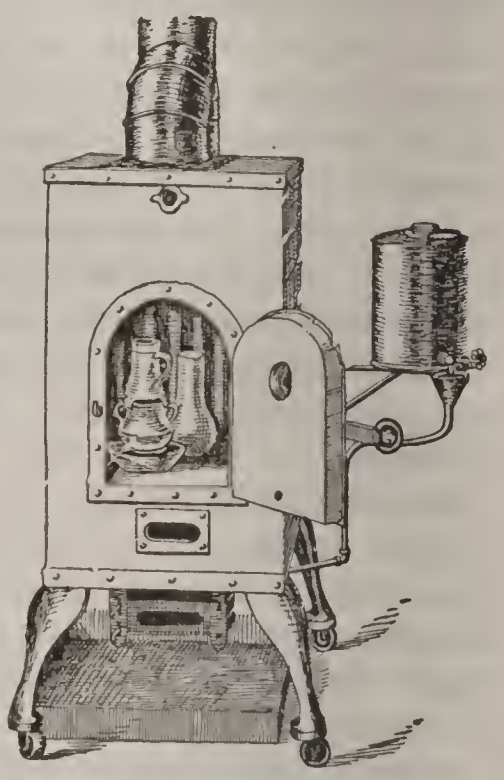
Brushes and Pads. Brushes called *square shaders* are considered best for general use and should figure in the collection in small, medium and large sizes. There are also *blender, pointed* and *tinting brushes, sable liners* for putting in the delicate touches, and various other kinds. A *pad,* or *pounce,* made of cotton covered with soft China silk or an old silk handkerchief, is used for tinting large surfaces and to some extent in blending. Brushes are quickly cleaned for use with a different color by dipping them into turpentine or alcohol, but the special ones kept for gold, enamels and India ink should never be used for the colors.

Choosing the Design. The first essential of the design is appropriateness. It must harmonize both with the shape of the article and with its purpose. The design must also be adapted to the space it is to adorn. A small vase or jar decorated with an elaborate landscape looks overloaded and uninteresting, whereas a delicate spray of blossoms or leaves or an attractive conventional design would have made it a thing of beauty, artistic and harmonious.

Drawing the Outline. After the design has been selected, the next thing is to decide how often it is to be repeated on the piece of china awaiting decoration. If one is painting a plate whose border calls for five applications or "repeats" of the design, the rim of the plate on the under side is accurately marked off into fifths by means of a cardboard measuring device called a *plate-divider.* Next the plate is washed perfectly clean and then rubbed over with a cloth moistened with spirits of turpentine, which gives the pencil lines a surface to adhere to.

If the design is a simple one it is frequently drawn freehand; if complicated, or if the worker is not skilful at drawing, a tracing from copy is generally made on transparent tracing paper and transferred to the china by going over the lines with some sharp point, such as that of a hard lead pencil or an ivory stylus. Most painters then secure the drawing by retracing with India ink applied with a pen or a very fine, pointed brush; or, if the finished work is to show an outline, they put it in at once with the mineral paints in the desired color, after which the piece is fired in order to fix the lines. In either case, the outline is fundamental and must be carefully and accurately drawn.

The Actual Painting. The next step is to make up or "set" the palette with the colors needed for working out the design. The worker is then ready to fill the spaces with color and apply the gold, enamel or luster called for by the design. Sure, firm strokes, making corrections unnecessary, are needed in applying mineral paints; for it must be borne in mind that, being transparent, they do not allow the same working-over that is possible with oils. One also must know which colors can be used together. A *gold color* such as ruby, for instance, will "eat" an *iron color* such as carnation, if painted over it, while yellows will eat almost any color over which they are applied.



A PORTABLE KILN

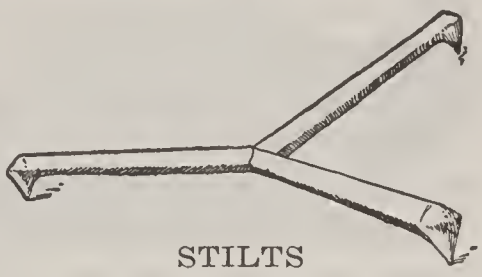
When the painting is completed the china is sent to the kiln for its first firing. If there is gold in the design it will need at least one more painting and then a second firing; and, in fact, the oftener the process is repeated, the heavier and richer the gold will look. It is not always necessary to go over the painting itself the second time, although this is generally done to enrich the color. It is not until the china has had its last firing that the gold portions are polished with what is called a *glass burnisher,* which is a brush made of spun glass; less frequently an *agate burnisher* is used, and sometimes *burnishing sand.*

What a China Kiln Is Like. There are many different makes of china kilns on the market, but in general those adapted for home or studio use are similar to the *portable kiln* here illustrated. This is made of metal lined throughout with fire-brick. The model shown burns kerosene oil, which seems generally conceded to be the ideal fuel because of its cheapness, availability, ease of regulation and freedom from disagreeable odors as well as noxious gases that might affect the brilliancy of the colors. There are kilns burning gas or

gasoline, and some that employ charcoal, the latter needing, however, to be fired out-of-doors on account of the fumes. A kiln the size of the one illustrated, which is about four and one-half feet in height, requires from one and a half to two hours to fire and consumes two gallons of oil.

The kiln is connected with the house chimney by means of an asbestos-lined stove-pipe. From the tank at the side the oil is fed mechanically into the burner—the small pan shown directly below the fire box; the larger pan underneath contains sand which absorbs any overflow. By means of a match applied directly to a small wad of asbestos placed in the burner, the kiln is lighted, and through an opening in the bottom of the fire box the heat is communicated to the lining tubes. Through these tubes the flames are drawn upward until they completely surround the interior of the kiln.

Regulating drafts in the burner make it possible to fire to the desired heat in any part of the kiln—a great advantage by reason of the fact that different kinds of paints and different grades of china require varying treatment. The china is *stacked* in the kiln with due regard to these considerations. In stacking the pieces, *stilts* of fire-clay are placed between to keep them separate, and care is taken not to pack them too close, so that there may be sufficient room for expansion.

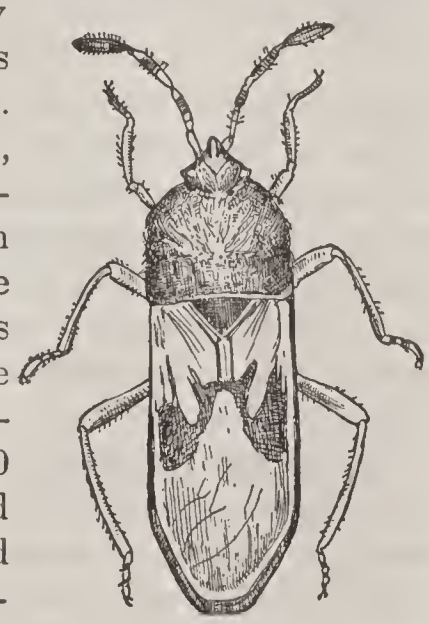


STILTS

The Firing Process. In the door of the kiln is a mica-covered "peep-hole" permitting the firer to watch the progress of the glazing and stop the firing at the proper time. When the china takes on a translucent appearance and begins to turn an ashy-red tint, it is time to stop the flow of oil and let the kiln begin to cool. Several hours must elapse before it is opened, however, lest the current of cold air admitted cause the china to break or "crackle." The china must never be removed until it has thoroughly cooled. L.M.B.

CHINA SEA, or **SOUTH CHINA SEA,** the largest of the enclosed seas lying along the east coast of Asia. These seas are formed by the long chain of islands in the Pacific Ocean extending from Kamchatka to the end of the Malay Peninsula. Formosa Strait connects it with the Eastern Sea on the north. The gulfs of Tonking and Siam are extensions of the China Sea on the west, and Manila Bay on the east. In the southern part this sea is very shallow, its average depth being less than 1,000 feet; farther north, however, it is 13,000 feet deep off the Philippine island of Luzon. As it is situated entirely within the tropics, violent typhoons sweep over it at certain seasons of the year and make navigation very dangerous (see TYPHOON). The Mekong and the Menam are two large rivers emptying into it. The great ports of Canton, Hong-kong, Saigon, Bangkok, Singapore and Manila all lie either directly on this sea or are near it. (See map of ASIA.)

CHINCH BUG, a small, blackish bug with white wings, found all over the United States and in Canada, Central America and the West Indies. It is the worst insect pest known to the wheat grower. In the United States alone the damage done by this bug each year is placed at $20,000,000. The adult insect, which is about one-sixth of an inch in length, spends the winter in old grass and rubbish. In the early spring each female lays about 500 eggs on the roots and stems of grain, and soon the newly-hatched insects, red in color, may be found in countless numbers, feeding on grains and grasses, particularly wheat. Corn is usually attacked later in the season. There are two generations each year, the second appearing in late July or early August. The broods keep together at first, moving on in great masses as the food is exhausted, and scattering when the insects reach maturity. In dry seasons they multiply at an appalling rate, but their numbers are kept down by cold springs and severe winters.



CHINCH BUG
About nine times actual size.

An effective method of protecting an uninfected field is to plow a deep furrow around the field, filling it with coal tar or petroleum to keep the pests out. The burning of waste grass and rubbish near the fields, in the fall, where the bugs are apt to hide through the winter, is also helpful. Other methods that have been tried with moderate success are the introduction of their natural enemy, the lady-

bird beetle, and the use of chinch bugs which have become infected with contagious diseases. Bulletins on methods of extermination will be sent on request by the United States Department of Agriculture, and by various state and provincial agricultural experiment stations.

CHINCHILLA, a squirrel-like animal of South America, one species of which is greatly valued for its beautiful pearly-gray fur. It is about fifteen inches long, with large ears, and tail about one-half the length of head and

CHINCHILLA

body. Chinchillas live in colonies in the mountains of most parts of South America, make numerous and very deep burrows and feed on roots and tough vegetable growths. The little animal is of a gentle, sportive nature, and very cleanly; when tamed it makes an interesting house pet. Chinchilla fur is used for muffs, coats and linings.

CHINESE EXCLUSION. Soon after gold was discovered in California in 1848 Chinese laborers began to come into the territory. Their number was small, and for many years there was no opposition to them, but about 1878 the immigration of Chinese to the Pacific states increased so rapidly that the citizens of those states became alarmed and appealed to Congress to enact a law restricting their immigration into the United States. In 1880 a treaty was ratified with China giving the United States the right to restrict or suspend Chinese immigration. In 1882 an act shutting them out for ten years and prohibiting the naturalization of Chinese was passed. In 1892 the Geary Act was passed. This continued the exclusion for another ten years, and compelled all Chinese in the United States to procure certificates of residence. In 1902 the law was continued and made still more comprehensive.

Objection to Chinese immigrants is largely confined to the Pacific states. The residents of those states claim that their method of living and the low wage for which they will work are demoralizing to American workmen, and that the sole purpose of the Chinaman is to save money for a few years and then return to his native land. In 1920 there were 61,639 Chinese in continental United States.

CHINESE-JAPANESE WAR. In 1894 a rebellion broke out in Korea (see CHOSEN) which was at that time strongly under the influence of the Chinese government. Japan also had large interests in Korea, which it had gained through negotiations with China. China sent troops to Korea to quell the disturbance, and Japan sent troops to protect its interests. When the rebellion was put down, the nations could not agree upon the withdrawal of their troops and this dispute led to war, which began in July, 1894, and was ended by the Treaty of Shimonoseki, April 17, 1895. The army and navy of Japan were far superior to those of China. Several important Chinese cities were captured, and the Chinese navy was destroyed. China ceded the island of Formosa (which see) and Liaotung peninsula to Japan and agreed to pay a war indemnity of about $150,000,000. The European powers, however, interfered and compelled Japan to cede Liaotung back to China. This war opened the way for the Great Powers to secure important trade concessions in China, and gave Japan such a preponderating influence in Korea that in 1911 the country was formally annexed to Japan.

CHINOOK', a name given by the early settlers to a warm, dry wind which blows down the slopes of the Rocky Mountains in the winter and early spring. It prevails at intervals in Montana, Wyoming, Oregon, Washington and in some of the western parts of Canada. The Chinook is always a *descending* wind, and for that reason is dry, having lost its moisture on the mountain tops. In coming down the mountains the pressure, due to the lowering altitude, squeezes out the moisture and raises the temperature at the rate of 1° F. for every 183 feet. Hence, in coming down from an altitude of 5,550 feet the wind would be 30° warmer at the bottom than at the top. This warm, dry wind spreads out over a large surface and absorbs or melts the snow and thus makes cattle grazing possible all winter in these regions. A similar wind called the *föhn* prevails in Switzerland.

The *wet chinook,* a moist, warm wind blowing southwesterly on the Pacific coast of Oregon and Washington, is often confused with the dry chinook; but it is entirely different. It was supposed to come from the country of the Chinook Indians, at the mouth of the Columbia River, hence the name.

CHINOOK, a tribe of Indians of the Chinookan family, who formerly lived in the southwest corner of the state of Washington, occupying the territory from the mouth of the Columbia River to Gray's Bay, a distance of about fifteen miles, and northward along the seacoast as far as the northern part of Shoalwater Bay. They first became known through the expedition of Lewis and Clark, 1803-1806. Their language formed the basis of what is known as the Chinook jargon, consisting of a mixture of Chinook, French, English and other words, which was for many years used by hunters and traders in dealing with the Indians as far north as Alaska, and is still employed to some extent. The Chinooks were tall, with broad faces. All tribes of the family practiced the custom of artificially flattening the head. They were great traders, exchanging goods with both native tribes and white men.

CHIPMUNK, a small ground squirrel, very common in North America. Its back is striped black and white, and its tail is nearly as long as its body. This cheery, friendly little animal loves the sunshine and hot weather, but when

CHIPMUNKS

the frost comes it goes to its tunnel-like burrow in the ground, and, living on the nuts and grains it has stored, practically sleeps through the long winter.

The intelligence of the chipmunk is seen in the construction of its ground home, hidden from all but the keenest eyes. Chipmunks rarely eat the eggs of birds, although it is thought a common occurrence. They do, however, run off with newly-planted corn, berries, apples, pears and tomatoes. They can be tamed quite easily, and many boys imprison them in cages as pets.

CHIPPENDALE. See FURNITURE.

CHIP'PEWA, an Indian tribe. See OJIBWA.

CHIROMANCY, *ki'ro man si.* See PALMISTRY.

CHIRON, *ki'ron,* in Greek mythology the famous learned centaur (half horse, half man) who taught such renowned heroes as Achilles, Hercules, Ulysses and Aeneas. Chiron was the son of Kronos (Saturn) and Philyra, and became skilled in medicine, music, hunting and the art of prophecy, under the instruction of Apollo and Diana. He lived at the foot of Mount Pelion, in Thessaly. One day the other centaurs were driven into Chiron's home by Hercules, and by accident a poisoned arrow from the bow of his old pupil struck Chiron. The poison caused him such torture that Zeus mercifully ended Chiron's life on earth and placed him among the stars, where he became the constellation Sagittarius, or The Archer. See CENTAUR; also map of the heavens, in article ASTRONOMY.

CHIROPRACTIC, *ki ro prak' tik,* **HEALING,** a method of treating disease by the adjustment of displaced vertebrae, founded on the theory that such displacement causes pressure upon the nerves which pass through the openings between vertebrae from the spinal cord to different parts of the body. Though this pressure is not sufficient to injure the nerve, it may be great enough to obstruct the passage of the nerve impulses to the various parts of the body for which they are intended, and may be the cause of disease. By certain definite thrusts the chiropractor seeks to remove the pressure on the nerves by replacing the displaced vertebrae, making possible a return to normal conditions. This method of healing was introduced into the United States in 1895 by Dr. D. D. Palmer. He classified the various kinds of possible displacements of the vertebrae and devised thrusts for their adjustment. There are now in the United States 5,000 physicians who practice this form of treatment, and it is taught in six large and several smaller institutions.

CHIROPTERA, *ki rop' te ra* (from the Greek for *hand* and *wing*), an order of night-flying animals—the bats—found in all parts of the world. The fingers of the fore limbs are greatly elongated and between these and the hind limbs and tail is stretched a thin membrane which forms the wings. The bones are slender and filled with a light marrow, and this lessens the animal's weight. The ears are often large in proportion to the size of the animal, whose sense of hearing is remarkably acute. See BAT; VAMPIRE BAT.

CHITONS, *ki' tonz,* a large family of mod-lusks with boat-shaped gray or brown shells. The shell is composed of eight pieces, often in contact with and overlapping one another, but never truly joining. The animal always clings to rocks or stones by means of a strong oval foot which extends the whole length of its

body. It also has the power of rolling itself up so that nothing but the shell is seen. Small chitons are found on the eastern Atlantic coast, larger ones in Florida and the Gulf of Mexico, and those eight and ten inches long—the giants—occur in California. West Indian negroes are said to eat the large chitons, which are abundant on their rocky coasts; they cut off and swallow raw the fleshy foot, which they call "beef." See MOLLUSKS.

CHIVALRY, *shiv'al ri,* a term which in the Middle Ages indicated a military feudal organization—the organization of *knighthood.* The term as now employed refers merely to the original spirit and aims of those knights—protection of the weak, gallantry toward women, honesty in everything.

The education of a knight in the days of chivalry was as follows: When he was seven years old he was sent to the court of some baron or noble knight, where he was taught the use of arms, how to ride and how to attend the ladies. When qualified for war, he became an *esquire,* or *squire,* and accompanied his lord in battle. The third and highest rank of chivalry was that of *knighthood,* which was usually not conferred before the twenty-first year. The person to be knighted prepared himself by confessing, fasting and keeping vigil all night over his arms. Religious rites were performed, and then, after promising to be faithful, to protect ladies and orphans, never to lie nor utter slander, to live in harmony with his equals and to protect the Church, he received the *accolade,* a slight blow on the neck with the flat of the sword from the person who *dubbed* him a knight. This was often done on the eve of battle, to encourage the new knight to brave deeds, or after the combat, to reward special bravery.

As a system of education for the nobles, chivalry taught them the best ideals, social and moral, which the times could understand. The spirit of chivalry led to the Crusades, and the deeds of knights have been much sung, by the "minstrels" in England and the "minnesingers" in Germany. Sir Walter Scott admired chivalry, and Spenser's *Faerie Queene* and Tennyson's *Idylls of the King* tell of knightly deeds and courtesy. But Cervantes' *Don Quixote* is a burlesque on chivalry and its tendency to affectation and exaggerations of sentiment.

CHLORAL, *klo'rahl,* a bitter, colorless, oily liquid with an irritating smell, the hydrate of which, in the form of a white crystalline substance, is extensively used in medicine. When *hydrate of chloral* comes in contact with alkalies in the human system it separates into chloroform and formic acid. The chloroform acts on the heart and brain, and when the hydrate is taken in prescribed doses it produces a refreshing sleep. It has been used with success in cases of insomnia, delirium tremens, Saint Vitus's dance, lockjaw, asthma and whooping cough. Too large doses may affect the mind seriously or cause death, and *hydrate of chloral* should only be used under expert medical advice. To treat poisoning by chloral, the person should be kept awake, his body warmed by friction or otherwise, hot coffee taken, and artificial breathing resorted to, if necessary.

Chloral is the poisonous principle in the "knock-out drops" employed by criminals to induce unconsciousness in their victims. J.F.S.

CHLORINE, *klo'rin,* a greenish-yellow gas with a disagreeable odor. If a small quantity of chloride of lime (bleaching powder) be placed in a shallow dish and a little dilute acid be added, chlorine will be set free and can be detected by its odor. The quantity liberated, however, will probably be so small that the gas cannot be seen. Chlorine has a very irritating effect on the nose and throat. Breathed in small quantities, it produces symptoms resembling those of a cold. One full breath of pure chlorine will cause death. Chlorine gas became a deadly weapon of warfare in the War of the Nations.

Chlorine is one of the elements of which common salt is composed, and it is manufactured on a large scale by separating salt into its elements, by passing an electric current through the liquefied or dissolved salt. In laboratories it is made for experimental purposes by placing two parts of salt to one part of manganese dioxide in a flask with dilute sulphuric acid, and heating the mixture; the chlorine is collected in vessels by running a pipe from the flask to the bottom of the vessel. The gas is heavier than air and pushes the air upward as it flows in, the same as does water. The name comes from the Greek word *chloros,* meaning *greenish-yellow.* Chlorine gas is easily liquefied.

Chlorine will not burn in air, but a number of substances burn in it; for instance, iron wire, when heated white hot and plunged into the gas, burns with a brilliant light. A jet of burning hydrogen placed in chlorine continues to burn, producing hydrochloric acid. Among

CHIVALRY AND FEUDALISM

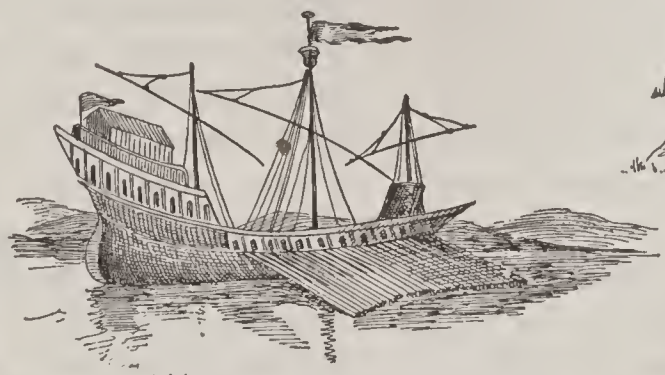
Costumes
Fourteenth and
fifteenth centuries

A knight and his castle

The ceremony of
homage. From a seal
of the twelfth century

Conferring knighthood
on the field of battle

Serf

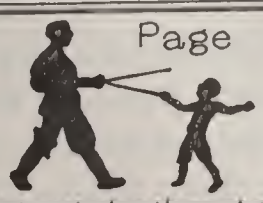


Water transportation
in the feudal age

A fully-armored horse and rider
From a bronze statue in Madrid

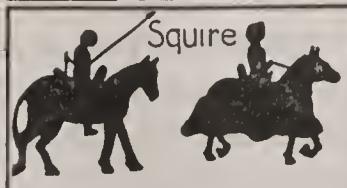
A tilting match
between two knights

DEVELOPMENT OF A KNIGHT



Page

Instructed in the art of war between the ages of seven and fourteen



Squire

As a squire he attended the knight to whom he was attached

Knighted

Knighted at the age of twenty-one

A full-fledged knight

the important compounds of chlorine are hydrochloric acid, chloride of lime, chlorate of potash and chloroform. Bleaching powder, or chloride of lime, is manufactured by placing slaked lime in a closed chamber and passing chlorine gas in. The lime absorbs and combines with the gas, whence the name of the product, *chloride of lime.* Chloride of lime is used extensively in cotton mills as a bleaching agent, and it is also used as a disinfectant and deodorant. See BLEACHING. J.F.S.

CHLOROFORM, *klo'ro form,* a powerful drug, now in wide use as an anesthetic. It was discovered at about the same time (1831) by three chemists, Samuel Guthrie of America, Liebig of Germany, and Soubeiran of France, each of whom worked independently of the others. The anesthetic value of the drug was brought to the general attention of the public in 1848 by Sir James Simpson of Edinburgh.

Chloroform is a heavy, colorless liquid, with a pungent odor and a sweetish taste. It dissolves freely in alcohol and ether, but does not mix with water. Besides being used in medicine, it is employed by chemists as a solvent for fats, alkaloids, iodine and other substances. Medicinally it is of great value. Preparations of the drug are often used to disguise the taste of offensive medicines, and externally it is used as a liniment in chronic rheumatism and neuralgia and as a local anesthetic for toothache due to ulceration. It is also employed as an antidote for strychnine poisoning and as a remedy for spasms in cases of lockjaw and hydrophobia.

When inhaled in small quantities chloroform deadens or abolishes the sense of pain, and larger doses render the patient unconscious. Though ether is considered the safer anesthetic, records show that no more than one death in 3,000 occurs through the use of chloroform in operations. It must never be employed, however, except under the direction of a competent physician. See ANESTHETIC: ETHER. W.A.E.

CHLOROPHYLL, *klo'ro fil,* the green coloring matter of plants, which does for them, in a way, what gastric juice in the stomach does for man. As gastric juice changes our food into elements that can be assimilated, so, too, does chlorophyll in plants. By absorbing the light it gets the energy to break into two parts the carbonic acid gas taken in by the leaves, returning one part, the oxygen, to the air, and keeping the carbon, which, mixed with the water the roots drink, makes starch. Starch can be formed by leaves only in the presence of light. Hence, leaves which are deprived of light will bleach, or turn white. See ETIOLATION.

CHOATE, *chote,* the family name of two American public men who won distinction in law and statesmanship.

Rufus Choate (1799-1859), one of the ablest lawyers America has ever produced and an eloquent and scholarly public speaker, was born at Ipswich, Mass. He was graduated at Dartmouth College in 1819 at the head of his class, and after studying law was admitted to the Massachusetts bar in 1823. He served in the House of Representatives from 1830 to 1834, and in the Senate from 1841 to 1845, and in the upper house won wide public notice because of his brilliant speeches on the tariff, the Oregon boundary and Texan annexation. His orations and addresses are distinguished for learning, purity of style, and grace and elegance of form.

Joseph Hodges Choate (1832-1917), the nephew of Rufus Choate, was born at Salem, Mass., and educated at Harvard College. Admitted to the New York bar in 1865, he soon became one of the best-known lawyers of New York City, and was employed in such famous cases as the income tax and the Tweed Ring suits (see TWEED, WILLIAM MARCY). He won greatest repute as a cross-examiner. On the organization of the Republican party in 1856 he adopted its political principles, though he never held a political office until 1899, when President McKinley appointed him to succeed John Hay as ambassador to Great Britain. In this position he strengthened the friendly relations between the two English-speaking nations. In 1905 he returned to his practice in New York, and two years later represented the United States at the second Peace Congress at The Hague.

JOSEPH CHOATE

CHOCOLATE, *chock'o late,* a valuable food preparation made from the kernels of the cacao tree, which appears on the market in the form of smooth, shining dark brown cakes, used in making a delicious beverage, in confectionery and variously in cooking. The cacao

tree bears a cucumber-shaped fruit containing reddish-brown seeds, and within the seeds are the dark-brown kernels from which chocolate is made. An illustration showing manner of growth accompanies the article Cocoa.

The seeds are roasted in large revolving cylinders to make the shells brittle, so they will come off readily. The kernels are then crushed in a grinding mill, the shells and dust being carried off by an air blast, while the smooth paste which flows out of the mill is molded into cakes of the desired size and shape and allowed to harden. If sugar and flavoring substances are worked into the paste, the hardened cakes are called sweet chocolate; the unflavored and unsweetened product is plain, or bitter, chocolate.

The beverage chocolate made by dissolving chocolate in hot milk is a wholesome, agreeable drink, when used moderately. Unlike tea and coffee, it has valuable food properties in addition to being an excitant of the nervous system. The uses of chocolate in making confectionery, pastry, puddings and ice cream are numerous and well known. It is rich in fat, the proportion being, on an average, 48.7 per cent, and is therefore a nutritious food. It should be used in moderation, however, especially when it is eaten in the form of candy. Physicians say that most American people, young and old, eat far too much chocolate candy, which is injurious to the teeth, the digestion and the nervous system, when used very freely. J.F.S.

CHOCTAW, *chok'taw,* one of the most powerful of the Indian tribes once living south of the Ohio River. When first known to Europeans they occupied the central and southern part of Mississippi and that portion of Alabama west of the Tombigbee River. They were farther advanced in agriculture than most other tribes and lived in permanent dwellings. They were a brave people, and most of their wars were in defense of their country against hostile tribes. De Soto entered the territory in 1540, captured one of their chiefs and was compelled to resist a fierce attack. They had the custom of flattening the heads of their children by placing bags of sand upon them, and from this custom obtained their name, which means *flathead.*

When the French began settlements along the Mississippi, the Choctaws became friendly with them and frequently assisted them in their wars against other tribes. After the French and Indian War they began to remove to lands west of the Mississippi. After the Revolutionary War they formed a treaty with the United States in which undisturbed possession of the land was guaranteed them. They aided the United States in the Creek War of 1813 and in 1832 sold all their land east of the Mississippi and removed to Indian Territory, where they established the Choctaw Nation with an organized government. Like all Southern tribes, they were slave holders and suffered from the War of Secession. Since that event they have continued to advance in wealth and civilization. They are now American citizens, well educated and influential in the state of Oklahoma, in which they live. They number about 10,000, but are slowly decreasing. For their customs and habits see Indians, American. See, also, Five Civilized Tribes.

CHOKE CHERRY. See Cherry.

CHOLERA, *kol'er a,* from two Greek words meaning *bile* and *to flow,* is the name applied to several forms of disease characterized by disturbances of the intestines.

Asiatic Cholera, one of the deadliest contagious diseases that affect mankind, but less dreaded than formerly, owing to advancement in medicine and sanitary science. It is caused by a specific germ identified by Dr. Robert Koch in 1883. It prevails in the East from Bombay to Southern China, chiefly in British India, and from these localities has spread from time to time by commercial routes on land and sea into other parts of the world, causing an appalling loss of life. Its permanent home is Lower Bengal. It is a disease which thrives on filth, contaminated water being the greatest source of infection. It has therefore been fought with the great modern weapons of sanitary science and through the application of the principles of sanitation has been conquered in nearly all civilized countries.

Symptoms and Treatment. Cholera has four stages, the first of which is characterized by slight fever, nausea, vomiting, headache, diarrhoea and prostration. In the next stage a frothy, watery substance containing bits of mucous membrane of the intestines is excreted. Then follows a period of collapse, and if death does not terminate the course of the disease, it soon subsides (the fourth period) and recovery is assured. The beginning and end of an attack may take place in less than twelve hours, or it may last ten days. Hot baths and injections of a salt solution into the rectum have been found helpful. Stimulants are some-

times of value in the early stage of diarrhoea and in that of collapse. Mustard poultices to soothe pain in the abdomen and cracked ice to relieve thirst are other remedial measures. Drugs of various kinds have been tried without distinct success.

Cholera Morbus, a much less serious ailment caused usually by eating food in which certain bacteria have developed toxic alkaloids. It is also brought on by over-taxing the stomach or drinking too much ice water, and occurs usually during the summer. Its symptoms are vomiting, diarrhoea, cramps and great weakness. Cholera morbus is not usually fatal. Treatment consists in purging the digestive tract and then administering opium and other drugs to relieve pain. Abstinence from food for several hours is essential.

Cholera Infantum, a disease that has a high death rate among babies, caused by a combination of excessive heat, improper feeding and bad sanitary surroundings. Breast-fed babies are much less susceptible to it than those fed from the bottle, and it is especially prevalent among poor families and in institutions. It is believed to be infectious in origin, but the specific germ which causes it is not certainly known.

Symptoms. Profuse diarrhoea, high temperature and prostration are three specially-marked symptoms that set this disease apart from other infant intestinal disorders. An attack usually begins abruptly with violent vomiting and purging, but it may be preceded by a preliminary spell of fever, loss of appetite and diarrhoea, lasting a few hours or perhaps a day or two. The stools at first contain contents of the intestines, milk curds and particles of undigested food mingled with intestinal mucus and liquid waste matter. Later the excretion becomes very thin and colorless, leaving a greenish stain. Passages are frequent and copious. Vomiting persists, occurring simultaneously with the watery purging, or nearly at the same time. As a result the child becomes very pale and emaciated and suffers from great weakness. Fever is present from the first, sometimes rising to 105°. The mouth becomes dry and glazed, the tongue dry and shiny or coated with brown fur. Intense thirst adds to the child's discomfort, especially since the stomach ejects whatever is given to relieve it.

Severe cases may terminate fatally in eight to ten hours, coma and convulsions sometimes occurring at the last. Collapse and brain complications are especially dreaded by physicians attending these cases. Milder attacks are conquered at the end of three or four days, cessation of vomiting being the first sign of convalescence. The highest death rate occurs among children less than a year old, who have been taken from the breast.

Treatment and Precautions. The sick baby should be put in the coolest and best-ventilated room of the house. Every case of cholera infantum should be placed in charge of a reliable physician and all treatment be directed by him. It is customary to wash out the stomach with warm sterilized salt or soda water. Following the flushing small doses of calomel are dropped on the tongue every half hour until from one to two grains are taken or the stools show green. Injections of water into the rectum are also given, as it is necessary to flush the whole of the large intestine. Following this an equal quantity of tannin solution is injected, in order to render inactive any poisonous proteins remaining after the first washing. Whatever drugs are administered must be given only as the attending physician directs. If milk is given, only that from the breast is safe to use. Thin rice or barley water, and later on beef juice or animal broths, are usually given when feeding is resumed.

This terrible scourge of childhood can often be prevented by scrupulous care and cleanliness. In hot weather the dangers to the babies are multiplied, and the mother should make every effort to shield her child from disease-breeders—impure milk, flies and unsanitary conditions of various kinds. Keep the child, its surroundings and its food hygienically sweet and clean.

W.A.E.

CHOPIN, *sho paN',* FREDERIC FRANCOIS (1810-1849), a celebrated musician, one of the great masters of modern piano music. He was born near Warsaw, Poland, of French parentage, and was given an excellent musical education. In 1829, at the age of nineteen, he played some of his own compositions at a public concert in Vienna, after which he trav-

CHOPIN

eled extensively. The political troubles of Poland drove him to Paris in 1831, where he resided for the rest of his life. Chopin's fame rests chiefly on his compositions for the piano, for he had a perfect appreciation of every effect which that instrument can produce. His mazurkas, waltzes, polonaises, preludes, etudes and nocturnes are a complete revelation of his dreamy, romantic nature and of his love for new and exquisite harmonies.

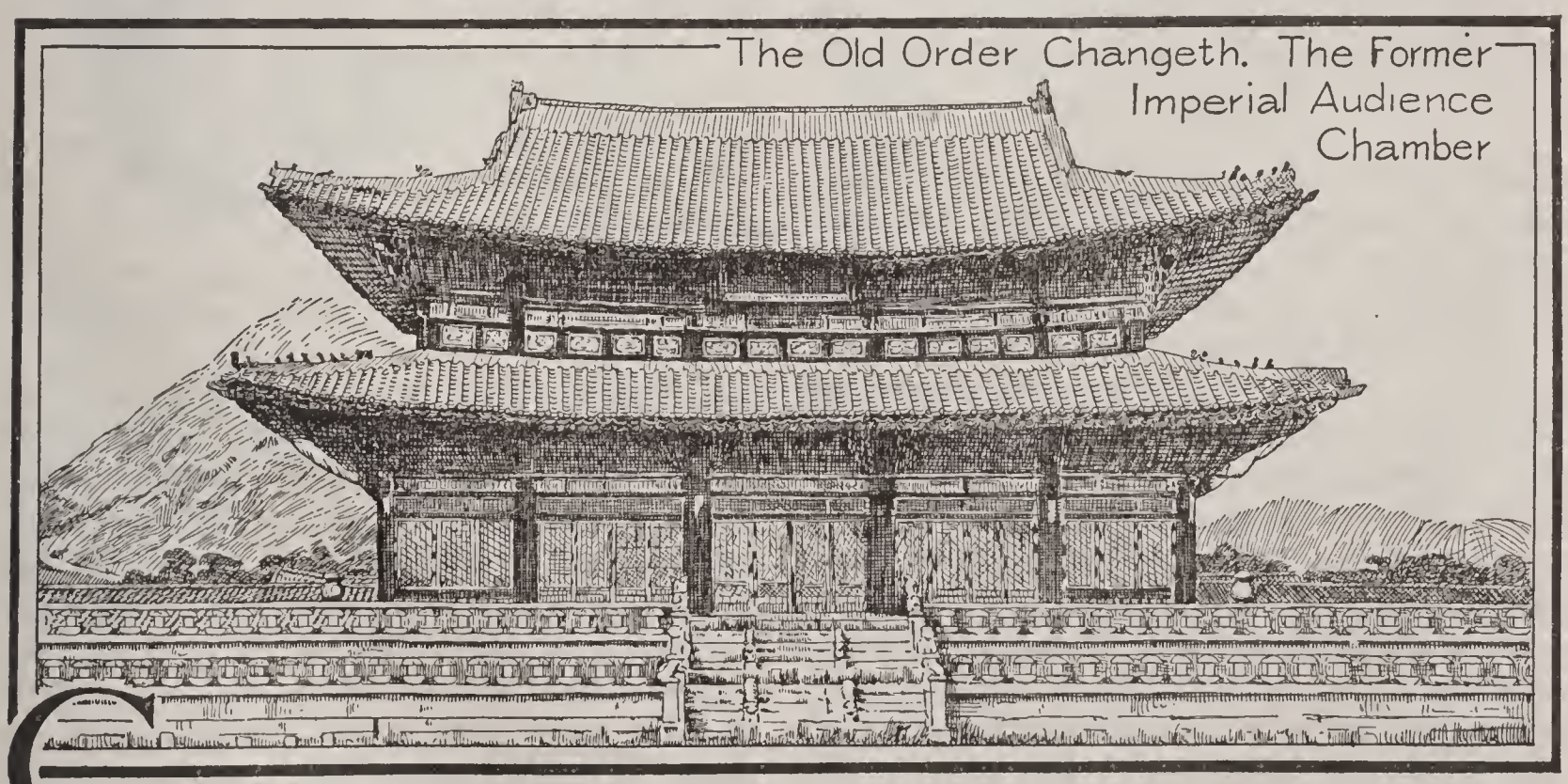
Chopin's music has an undercurrent of melancholy that suggests the unhappy lot of his native country, Poland, and his celebrated *Funeral March* is one of the most effective compositions of that character ever composed. His own age recognized his greatness; Mendelssohn, born the same year as Chopin, said of one of his pieces, "It is so perfectly beautiful that I could go on forever playing it."

CHORUS, *ko'rus,* the name now applied to groups of singers in operas, oratorios, cantatas and church choirs, and to the part of a musical composition which is sung by several voices. It was in ancient times a term for a sacred Grecian dance, accompanied by song, which formed a part of the festivals of the gods. From the choral dances of the feast of Dionysus Greek drama came into being, and in the course of time the word was applied to troupes of singers and dancers who took part in the performance of the plays. In the tragedies written by the Athenian dramatists the number in the chorus was reduced from fifty to twelve or fifteen, and with accompanying dancing movements they sang lyrical passages connected with the subject-matter of the drama, thus heightening the effect produced by the actors.

The Modern Chorus. The chorus in a present-day operatic composition is generally an important feature of the work, and is used with particular effectiveness in music-dramas. For instance, in Wagner's opera *Tannhäuser,* he introduces the stately *Pilgrims' Chorus* with striking effect just at the point where Tannhäuser, wearied of his life of sin, is about to begin his pilgrimage to Rome. The chorus in a grand opera nearly always serves admirably to heighten the impression of the scene of which it is a part.

In an oratorio, also, the chorus is of great importance, and when large numbers of singers are properly trained they make the noble choral music of the composition supremely beautiful. It is said that when Handel's *Messiah* was first produced the people of the audience were lifted spontaneously to their feet by the glorious music of the *Hallelujah Chorus.* Audiences since then have continued to express in the same manner their reverence for this masterpiece of choral music.

The word is also applied to that part of a song which is repeated at the end of each stanza, as the "Glory, glory, hallelujah!" refrain in Julia Ward Howe's *Battle Hymn of the Republic.*



CHOSEN', formerly known as KOREA, but since 1910 a Japanese province, occupying the mountainous peninsula southeast of Manchuria between the Japan and Yellow seas. It is one of those many small Asiatic kingdoms over which more powerful governments have gradually extended their authority, with mutual benefit to the countries. In the latter

part of the tenth century, Kaoli, one of the three kingdoms of the peninsula, rose to a commanding position, and its name was extended to the whole territory, Korea being a local pronunciation of the word. From 1392 to 1897, during the Ming dynasty, CHOSEN, an ancient name, meaning *morning freshness* or *morning calm,* was in use. When the kingdom became independent of China in 1897, it was called *Tai Han,* but when annexed by Japan in 1910, *Chosen* was adopted as the official name of the peninsula. Most of the rivers and cities have been renamed by the Japanese, but the more familiar Korean names are still commonly used.

Having an area of about 86,000 square miles, Chosen is a little larger than the state of Utah. Wooded mountains cover the north half of the peninsula, and a high, narrow range rises precipitously from the sea along the entire

LOCATION MAP

length of the east coast. West of this range, the treeless, gray foot-hills flatten out into fertile plains, the chief agricultural section of the peninsula. The steep eastern coast is penetrated by few harbors, but the south and west coasts are fringed with bays and clusters of islands and are washed by dangerous tides. The largest island is Quelpaert, off the south coast. The most important harbors are the picturesque ports of Won-san (Korean *Gensan*), Lazareff and Fusan (*Pusan*). The largest river is the Oryoku (*Yalu*), rising in Pei-shan, an extinct volcano, and flowing south into the Yellow Sea, forming the northwest boundary of the country. Sea-going junks ascend the stream for a distance of thirty miles, and smaller boats 145 miles farther. The Daido (*Tai-dong*), Kan (*Han*), Rakuto (*Nak-dong*) and Mok-po are other large rivers, navigable for many miles. On the whole, the country lacks the dainty picturesqueness of flowered Japan and the fantastic beauty and buzzing, palpitating life of China.

The climate is pleasant nine months of the year, resembling that of the opposite coast of China. In the central and northern parts winters are somewhat severe, and snow covers the ground from December until February. The winters of the south are delightful, like those of Southern Japan. The temperature ranges from 5° in the winter to 90° in July. The average rainfall is thirty-six inches, most of it falling during the summer months.

The People. The natives of Chosen are a mixed race, combining the characteristics of the Chinese, Japanese and Malayan people. They excel the Japanese and Chinese in stature and physique, and are more regular of feature and lighter of skin than the Mongolians. The Koreans are rapidly adopting European customs of living. In 1920 the population numbered 17,264,119. A large proportion were Japanese and Chinese, and about 1,000 were Americans and Europeans. Among the largest towns are Keijo (Korean, *Seoul*), the capital; Fusan, Kwangju and Ping-yang.

PEASANT GIRL WITH BABY SISTER

There are many religions among the Koreans, including Confucianism, Buddhism, spiritualism, fetish and nature worship. Ancestor worship is universal and plays an important part in the life and morals of the natives, who are more superstitious than religious.

In no other Asiatic country has the growth of Christianity been so rapid and of such influence upon the national life. Although there were frequent persecutions before 1885, the number of converts continually increased, and in that year religious freedom was guaranteed. The Y. M. C. A., established at Keijo (Seoul)

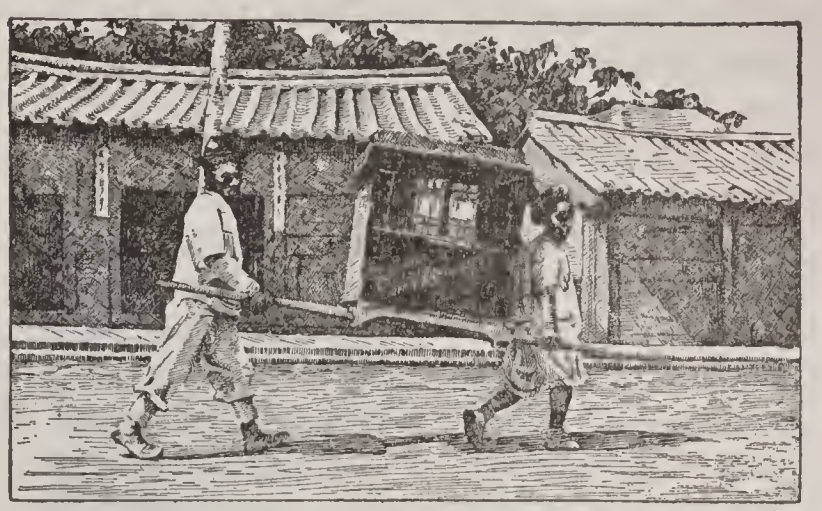
in 1907, is aided by the government. In 1920 there were over 320,000 Christian converts in Chosen.

The present government has established a school system, embracing common, industrial and special schools, and girls are now educated equally with boys. Many of the old classical Chinese schools for boys still exist, but the system is being rapidly Westernized. There are also several hundred religious schools established by Christian missionaries.

Industry and Commerce. About three-fourths of the population are engaged in agriculture. Japan has introduced improved methods of cultivation and irrigation, reforming the primitive customs of the natives. Cattle raising is becoming important, and butter and cheese, formerly unknown, have also been introduced. There has been a revival of the cultivation of ginseng; the crop in 1920 was valued at nearly $20,000,000. Rice is the most important crop, but barley, oats, wheat, maize, tobacco, cotton, hemp, sweet potatoes and other vegetables are raised extensively. Mulberry trees grow in abundance, and the cultivation of the silkworm is important. The seas teem with fish, and Japan has recently passed regulations protecting and encouraging the fishing industry. Since the Russo-Japanese War the whale-fishing industry of the northern waters has been in the hands of the Japanese. Many fish, including haddock, halibut, herring, sardines and sharks, are caught. The Chosen Marine Products Association has been established and receives an annual government subsidy.

The Japanese government has also attempted to develop the gold mines of the peninsula, and an official mineral investigation of the entire country was begun in 1916. Nearly all of the important gold mines are controlled by foreigners; the United States concession, covering 800 square miles in 1912, is the largest. There are also valuable deposits of anthracite, iron, graphite and copper. The value of the mineral products is estimated at $12,000,000 per year. The government encourages manufacturing industries by financial assistance; the manufacture of paper, sea salt, grass-cloth, mats, bamboo screens and pottery is important.

Korean highways are notoriously poor. Wheeled vehicles are little used, baggage being carried by porters, pack horses and oxen, while the people travel on horseback or in sedan chairs. The Japanese government appropriated $4,980,000 for the improvement of roads in 1914, and paved streets were constructed in Keijo (Seoul) in 1915. There are three lines of street cars in the capital. In 1920 there were 1,152 miles of railroad in the peninsula, connecting with Chinese and the Russian Siberian lines. By way of the Trans-Siberian system it is possible to reach Moscow from Chosen in



A LADY'S SEDAN CHAIR

ten days, and Berlin in eleven and a half days. There is good steamer and ferry service with Japan, and fourteen treaty ports are now open for trade, which is chiefly carried on with Japan, Great Britain, China and the United States.

Government. Chosen is controlled by a Japanese governor-general, assisted by the secretaries of the several departments and the central council, the latter consisting chiefly of Koreans. Provinces, districts and villages are largely administered by Koreans; and financial aid and advice are furnished by the central government through Japanese clerks. Courts, prisons, customs, lands and railroads are all controlled by the central government at Tokyo.

History. Korea is believed to have been founded in 1122 B. C. After many centuries of independent life it was annexed to the Chinese Empire in 108 B. C. Soon after the beginning of the Christian Era it was divided into three small kingdoms, the one called Kori becoming paramount in A. D. 960, and for three hundred years Kori, or Korea, existed as an independent kingdom. A revolution in 1392 interrupted this period of prosperity, overthrew Buddhism and established the Ming dynasty. Two centuries later the country was invaded by the Japanese, who were finally expelled by the Chinese. For this military assistance Korea again became tributary to China. At the close of the Chinese-Japanese War in 1894 independence was regained, and Japanese influence was established.

In 1895 there was a revolt against the Japanese influence, and Russian influence existed for a short time. The Russians secured a large

timber concession on the lower Oryoku (Yalu) River which Japan regarded as an attempt to secure Korean territory. Japanese troops were sent to Korea, and on February 23, 1904, the emperor of Korea signed a treaty with Japan, strengthening Japanese influence and practically ending Korean independence. Japanese financial and diplomatic advisers were soon appointed, and in the Treaty of Portsmouth, September 5, 1905, which concluded the Russo-Japanese War, Russia formally recognized Japanese predominance in Korea. A resident-general was established by Japan in 1905. Two years later all administrative appointments were made subject to the resident-general, and in 1909 the administration of justice and prisons was acquired by Japan. The murder of Prince Ito, the resident-general, hastened the final absorption of Korea into the Japanese Empire, and on August 23, 1913, Chosen was formally annexed to Japan and the name Korea was abolished. The emperor was deposed and the government-general of Japan was established. E.B.P.

Other Items of Interest. It is estimated that there has been an average of one convert to Christianity for every hour since the first missionary entered the country.

Chosen has a coast line of 1,740 miles, one and a half times as long as that of Florida, which it somewhat resembles in shape.

A popular name for Chosen until after the middle of the nineteenth century was the "Hermit Kingdom," for foreigners were rigidly excluded.

The Koreans have a language of their own, which differs decidedly from Chinese, but practically all the books written in Korea are in Chinese.

Clothes in Chosen are not ironed, but are beaten smooth with two wooden sticks, and at any time of the day the *thump, thump, thump* of these paddles may be heard in any Korean city.

Until the country was taken in charge and "modernized" by Japan, every man in Korea wore on his head a tightly twisted topknot of hair, but Japanese laws forced the shearing of these. Barbers were stationed in every city to seize all who passed by and clip their topknots.

Not many beggars are to be seen, but living conditions among the poorer classes are squalid. The commonest form of house is a straw-thatched mud hut, and the state of such a dwelling after a hard rain may be imagined.

Consult McKenzie's *The Unveiled East;* Landor's *Corea, The Land of the Morning Calm;* Langford's *The Story of Korea.*

Related Subjects. The following articles in these volumes will give additional information on topics connected with Chosen:

Chinese-Japanese War	Rice
Ginseng	Russo-Japanese War
Japan, subtitle *History*	Seoul
	Yalu River

CHRIST, meaning *an anointed one,* a title of Jesus of Nazareth. See JESUS CHRIST.

CHRISTCHURCH, one of the most prominent cities of South Island of New Zealand, on the Avon River, seven miles from the sea. It is the center of a grazing district that produces the best wool and mutton to be found in New Zealand. Every street in the city is named after some British bishopric, and among the finest buildings is the cathedral, an exact copy of the cathedral of Caen, France. Clothing, boots, shoes and agricultural implements are manufactured, and a large export trade is carried on in lumber, wool, frozen meats and dairy products. Population in 1921, 105,670.

CHRISTIAN, *kris'chan,* the name borne by several Danish monarchs, the first of whom reigned as king over united Denmark and Norway from 1448 to 1481. Of this group of sovereigns, Christian VIII, IX and X have ruled over Denmark alone, since 1863.

Christian IX (1818-1906), who came to the throne in 1863, on the death of Frederick VII, was often called the "father of the royal families of Europe." His eldest daughter, Alexandra, became the wife of Edward VII of England; his second daughter, Dagmar, was the mother of Czar Nicholas II of Russia; his son, George, became king of Greece in 1863, after the revolution which deposed Otto II; and his grandson, the son of George, is Constantine I, until 1917 king of that country; Christian's grandson, Charles, was chosen king in 1905, when Norway separated from Sweden, of Norway as Haakon VII. During the reign of Christian, Schleswig and Holstein were wrested from Denmark by Austria and Prussia

CHRISTIAN IX

(see SCHLESWIG-HOLSTEIN). In the latter part of his reign a liberal government was established in the kingdom. He was a man of high character, winning not only the affection of his subjects but the respect of all the other rulers of Europe. On his death his son, Frederick VIII, succeeded him, and ruled for six years.

Christian X (1870-), son of Frederick VIII, was crowned in May, 1912. He came to the throne with considerable experience in the affairs of government, for during his father's numerous absences he was frequently called upon to act as king. His first speech, promising his people to guard their liberty and happiness, was an auspicious beginning of his reign, and he has since proved himself a capable and liberal-spirited ruler.

CHRISTIAN CHURCH. See DISCIPLES OF CHRIST.

CHRIS'TIAN ENDEAV'OR, YOUNG PEOPLE'S SOCIETY OF, an organization of the young people of evangelical Protestant churches for Christian service and the promotion of the spiritual life, founded by Rev. Francis E. Clark at Portland, Me., in 1881. The idea originated with Dr. Clark's experience in his own Church, the Congregational, where he had successfully brought the young people together for a weekly meeting for prayer and consecration, to which literary and social work had been added. The results were so encouraging that soon other churches took it up, and the movement spread rapidly all over the United States and Canada. Crossing the ocean, it was taken up by England and all its colonies, and by China, Japan, India and all countries where Christian missions were established.

The society has for its motto "For Christ and the Church," and it has done splendid work in employing the activities of the young people of the Churches in Christian service. The organization is interdenominational, each society being closely affiliated with its own Church. The United Societies of Christian Endeavor was organized in 1885, and holds biennial conventions. In 1905 a World's Christian Endeavor Union was formed, which holds a world's convention every four years. In 1916 there were over 77,000 local chapters with more than 4,000,000 members.

The Methodist Episcopal denomination is the only one that officially has no part in the Christian Endeavor work, as the young people's society of that Church, known as the Epworth League, is a distinct organization (see EPWORTH LEAGUE). The Christian Endeavor Society is recognized by all the other branches of Methodism, and by all the other evangelical denominations in their denominational unions or departments of young people's work. Christian Endeavor societies in the Baptist Church have the same rights and privileges as the branch societies in the Baptist Young People's Union (which see). W.S.

CHRISTIAN ERA, the period of time beginning with the birth of Christ, extending to the present date and to continue indefinitely. In the sixth century, a monk named Dionysius introduced the custom of reckoning the years from the birth of Christ; this method is now employed almost universally in Christian countries, although the practice did not become general until the fifteenth century. The year was often taken to begin on December 25, and for a while on various dates between December 25 and March 25. But now January 1 marks the beginning of the year in almost all countries. It is believed that Dionysius made a mistake of about four years in his reckoning and that Christ was born about four years before the Christian Era. See CHRONOLOGY.

CHRISTIANIA, *kris ti ah' ne ah,* or **KRISTIANIA,** the capital of Norway, the most important port of that country and the center of its business interests. It is situated at the head of a long and narrow gulf called the Christiania, about sixty miles from the Skagerrak, an arm of the North Sea. The city was established in 1624 on the site of an older town, called Oslo. The modern city is well built and has rapidly growing suburbs. Many of the buildings of the former city still remain, among them being churches which date from the twelfth century. Christiania forms a separate governmental district, as does Washington, in the United States, and is officially administered by a burgomaster and two councilmen.

The royal palace, residence of the king and queen of Norway, is not an imposing building, but has beautiful gardens. The university, established in 1813, is a strong school with a library of 495,000 volumes and an enrollment of 1,600 students. The manufactures consist chiefly of cloth, ironware, tobacco, paper, leather, soap, spirits and glass. Half of the imports of Norway pass through the port of Christiania, which also distributes over one-fifth of the exports. By means of special ice breakers the deep and commodious harbor is kept open for shipping throughout the winter. Population, in December, 1920, 258,341.

CHRISTIANITY, the religion established by Jesus Christ. The followers of Jesus were first called *Christians,* or *followers of Christ,* at Antioch in Syria about A. D. 65. The fundamental doctrines of Christianity are set forth in the Apostles' Creed (which see). They are as follows:

1. Belief in God as the Father.
2. Belief in Jesus Christ as the Son of God.
3. Belief that Christ arose from the dead and that He is and forever will be the Judge of both the living and the dead.
4. Belief in the Holy Spirit and the resurrection of the body.

Christianity presupposes belief in the immortality of the soul. It is considered to be of supernatural origin, a religion instituted by divine revelation. For this reason the followers of Christianity believe it to be the only true religion, and that it is their duty to persuade all men to accept it. This belief lies at the foundation of the missionary movement of the Christian Church.

Christianity had its birth in Palestine, from whence it spread to Asia Minor, Southern Europe and the countries in Northern Africa. It is now the accepted religion of all the countries of Europe except Turkey, of all the countries of North and South America, Australia and the Union of South Africa. There is not a country in which Christianity is not known, and Christian missionaries have established stations among practically all people outside of Christian nations. Its followers outnumber those of any other religion, as shown by the following table:

Christianity	564,500,000
Confucianism	300,800,000
Hinduism	210,000,000
Mohammedanism	221,000,000
Buddhism	138,000,000

For a detailed list of topics connected with Christianity, see the *Related Subjects* division at the end of the article RELIGION.

CHRISTIAN SCIENCE, or THE CHURCH OF CHRIST, SCIENTIST, a system of religion founded by Mary Baker Eddy, who gives the following statement of its origin in her book, *Retrospection and Introspection:*

> The discovery came to pass in this way. During twenty years prior to my discovery I had been trying to trace all physical effects to a mental cause; and in the latter part of 1866 I gained the scientific certainty that all causation was Mind, and every effect a mental phenomenon.
>
> My immediate recovery from the effects of an injury caused by an accident, an injury that neither medicine nor surgery could reach, was the falling apple that led me to the discovery how to be well myself, and how to make others so.

The teachings of the denomination are completely set forth in Mrs. Eddy's book, *Science and Health, with Key to the Scriptures,* which is the Christian Science text-book. Christian Science is based upon the proposition that God is all, that He is infinite Spirit, or Mind, the only actual reality, and therefore cannot be comprehended by the so-called material senses but must be spiritually discerned. God is further defined as Life, Truth and Love. Christian Science teaches that since God is infinitely good, He has not created any form of evil, and that sin, sickness and death are errors of the human mind and not the realities of being. It further teaches that the healing works of Jesus were a manifestation of divine, natural, scientific law operative throughout all time, and that this law of God expressed in human affairs to-day heals the sick and the sinner in accord with Jesus' promise.

In 1879 Mrs. Eddy founded the Christian Science Church "to commemorate the word and works of our Master, which should reinstate primitive Christianity and its lost element of healing" (Church Manual). In 1892 the Church was reorganized as the First Church of Christ, Scientist, in Boston. All Christian Science churches are branches of the Mother Church, the membership of which extends throughout the civilized world.

The various churches maintain free public reading rooms for the use of those seeking information on the subject of Christian Science. One of the important activities of The Mother Church is an official board of lectureship, the members of which upon invitation of the churches go to all parts of the world explaining the teachings of Christian Science in free public lectures.

The headquarters of the movement are in Boston, and all authorized Christian Science literature is published by the Christian Science Publishing Society, in that city. The periodicals founded by Mrs. Eddy are *The Christian Science Journal,* a monthly; *The Christian Science Sentinel,* a weekly; *Der Herold der Christian Science,* a German monthly; *The Christian Science Quarterly Bible Lessons;* and *The Christian Science Monitor,* a daily newspaper. See EDDY, MARY BAKER. A.C.

All approved literature bearing upon the subject is restricted to the official publications, under control of the Christian Science Publishing Society.

CHRISTIAN SCIENCE MOTHER CHURCH.

The new church is centered in the picture. At the right, the original church; at the left, the publications office. The portrait is that of Mrs. Eddy, the founder.

CHRISTMAS PROGRAMS

1

Be merry all, be merry all,
With holly dress the festive hall;
Prepare the song, the feast, the ball,
To welcome merry Christmas.
—*Spencer.*

Song, *God Rest Ye, Merry Gentlemen* .....*Old Carol*
The First Christmas.....*Luke* II, 8-21
The Birds of Bethlehem.....*Gilder*
Christmas .....*Proctor*
The Fir Tree (adapted).....*Andersen*
Song, *O Little Town of Bethlehem*..*Brooks*
Jest 'Fore Christmas.....*Field*
Little Gottlieb.....*Cary*
Scenes from *A Christmas Carol*...*Dickens*
Christmas at the Cratchits
Christmas at Scrooge's Nephew's
Christmas in Old Time.....*Scott*
The Little Christmas Tree.....*Coolidge*
How the Fir Tree Became the Christmas Tree
Christmas Everywhere To-night...*Brooks*
While Shepherds Watched Their Flocks .....*Deland*
Song, *It Came upon the Midnight Clear*

2

For little children everywhere
A joyous season still we'll make;
And bring our precious gifts to them,
Even for the dear child Jesus' sake.
—*Cary.*

Song, *Silent Night, Holy Night*
Christmas Bells.....*Longfellow*
A Visit from Santa Claus.....*Moore*
Why the Evergreens Keep Their Leaves in Winter
Old Christmas.....*Howitt*
Christmas Snow.....*Spofford*
Scene from *Cricket on the Hearth*..*Dickens*
The Party at Caleb's
Song, *While Shepherds Watched Their Flocks by Night*
Why the Chimes Rang.....*Alden*
Christmas Song.....*Field*
Kris Kringle.....*Aldrich*
The Little Match Girl.....*Andersen*
Kris Kringle's Travels.....*Best*
What Child Is This?.....*Old Carol*
Carol's Dinner Party, From *The Birds' Christmas Carol*.....*Riggs*
Song, *Away in a Manger*.....*Luther*

CHRISTMAS, *kris'mas,* the day celebrated in all Christian countries as the day of the birth of Christ, "the Prince of Peace," "the King of Kings." That day, by common consent December 25, is marked by special religious services in various churches, by charitable deeds, the exchange of gifts, and by merry-making and rejoicing. It is on that day, as Longfellow wrote, that we hear Christmas bells—

> Their old familiar carols play,
> And wild and sweet
> The words repeat
> Of peace on earth, good-will to men!

The time when the Christmas festival was first observed is not definitely known. It is spoken of in the beginning of the third century by Clement of Alexandria, and Chrysostom speaks of it in the latter part of the fourth century as a custom of long standing. Other dates were often celebrated as the day of the Nativity, but finally December 25 was universally adopted; there is no evidence that the date is absolutely correct. But exactness on those points is now not so important as the "spirit of Christmas," the spirit of giving, of helping—a broad, all-embracing love for our fellowmen. Margaret E. Sangster in the poem *Christmas-tide* puts the sentiment in verse:

> At Christmas-tide the open hand
> Scatters its bounty o'er sea and land,
> And none are left to grieve alone,
> For love is heaven and claims its own.

The giving of presents, the use of holly, mistletoe, Yule logs, the wassail bowl, have all descended from the days of paganism, but they are things which set the day distinctly apart from all other holidays. And without the Christmas tree and Santa Claus for the little folks the day would be incomplete and lose much of its deeper meaning to families. The custom of sending greetings on "Christmas cards" started about fifty years ago.

In recent years many cities have adopted the beautiful custom of celebrating the festival as communities. Great Christmas trees, glowing with innumerable lights, are set up in a central location, such as Madison Square, in New York, or the Lake Front, in Chicago, and on Christmas Eve the people gather about these trees and sing the familiar hymns and carols that are associated with the birth of Christ. The community Christmas tree is symbolic of that spirit of kindliness which moves people everywhere to help their less fortunate brothers and sisters.

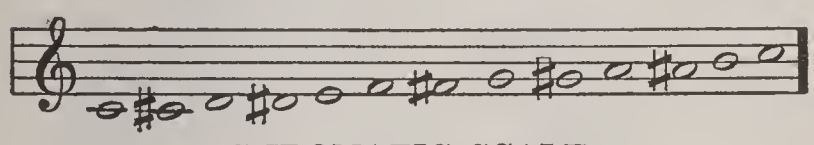
Many fine stories have been woven about the Christmas spirit and Christmas merry-making. Dickens' *Christmas Carol,* the story of Scrooge and "Marley's Ghost," is one widely read and loved. See CAROL, for one of the most famous Christmas carols ever written.

A Christmas Carol, one of the most beautiful and most inspiring of all Christmas stories. It was written by Charles Dickens, and published in 1843, and the 15,000 copies that were speedily sold brought the author about $3,500. *A Christmas Carol* is the story of a "clutching, covetous old sinner" by the name of Scrooge, who "iced his office in the dog days and didn't thaw it one degree at Christmas." How the Ghosts of the Christmas Past, Present and Future brought about the regeneration of the selfish old miser is told in a series of pictures that have all the humor, the pathos and the realism that are a part of the author's genius. Tiny Tim, the crippled child of Scrooge's browbeaten clerk, is one of Dickens' well-loved creations. The story is one that children and their elders read and re-read with equal delight. Thackeray called it a national benefit, and declared no better charity sermon had ever been preached.

CHRISTY, *kris'ti,* HOWARD CHANDLER (1873-), an American painter and illustrator with a dashing but not exaggerated style, creator of a picturesque and romantic type of society woman. He was born in Morgan County, Ohio, and studied at the National Academy and the Art Students' League in New York.

During the Spanish-American War he went to Cuba with the "Rough Riders," and the illustrations he made there, which were published in *Scribner's* and *Harper's* magazines and in *Collier's Weekly,* aroused the first interest in his work. A portrait of Colonel Roosevelt gained him special prominence later, but he is best known through his black and white illustrations of serial stories in magazines and for his illustration of several of James Whitcomb Riley's books. Christy pictures are favorites, also, as colored prints on magazine covers.

CHROMATIC, *kro mat'ik,* **SCALE,** in music, the scale produced by dividing the whole tones of the natural, or diatonic, scale into half-tones. The chromatic half-tone, or semitone, is the interval between a note and that note raised



CHROMATIC SCALE

by a sharp or lowered by a flat. The chromatic scale, with the two half-tones already in the diatonic scale, is an octave divided into twelve semitones. Composers make use of the chromatic tones to produce many beautiful effects in music. See Music; Scale.

CHROME, *krome,* a name applied to a number of substances used as the basis of paints. *Chrome yellow* is a compound of chromic acid and lead. *Chrome green,* a compound of chromium and oxygen, is used by calico printers and for enamels; it is also the basis of a number of green paints and dyes, which are not poisonous. *Chrome red* is a compound of chromium and lead. All chrome colors are noted for their clearness and brilliancy.

CHROMITE, *kro'mite,* or **CHROMIC IRON ORE,** a mineral, the chief ore from which chromium is extracted. It contains about sixty-eight per cent of chromic oxide and about thirty-two per cent of ferrous oxide. It is of black or brownish-black color, with a submetallic luster, and resembles magnetite or magnetic iron ore in appearance. Chromite is largely used in the preparation of paints, in calico-printing or dyeing of cotton goods, and in the extraction of chromium and its compounds. Formerly it used to be mined in great quantities in the United States, but at present only small quantities are produced from that source. The chief sources of supply are Canada, New Zealand, Australia, Russia and Turkey. The chemical formula of chromite is $FeCr_2O_4$. (See Chromium).

CHROMIUM, *kro'mi um,* a rare metal, valuable chiefly for its compounds. It is never found in a free state, but may be obtained from *chromite,* a compound of chromium and iron, sometimes known as chromic iron ore (see Chromite). Chromium is a hard, steel-gray metal which is usually produced in the form of a powder. It melts only at a very high temperature, and for this reason is but little used. A small quantity, less than one per cent, added to steel, produces *chromium steel,* noted for its hardness, fine texture and strength. A compound of chromium and lead forms *chrome yellow,* which is an important basis of yellow paint. *Chrome green,* or ultramarine green, is a compound of chromium and oxygen. *Potassium bichromate,* a compound of chromium and potassium, is used in dyeing, in photography and in the production of a number of chromium compounds used in the manufacture of paints. Chromite is also an important source of paints.

CHRONICLES, *kron'i k'lz,* Books of, two books of the Old Testament which follow the books of *Kings.* The name in Hebrew means *Acts of the Days.* In the Hebrew scriptures *Chronicles* consists of only one book. The division was made when the Septuagint (which see) was written. *Chronicles* differ from *Kings* in giving more fully the religious side of the history of Israel during the period covered, and in giving the history of the kingdom of Judah to the exclusion of that of Israel after the kingdoms were divided. It is thought that these books were written by the priests. See Kings, Books of.

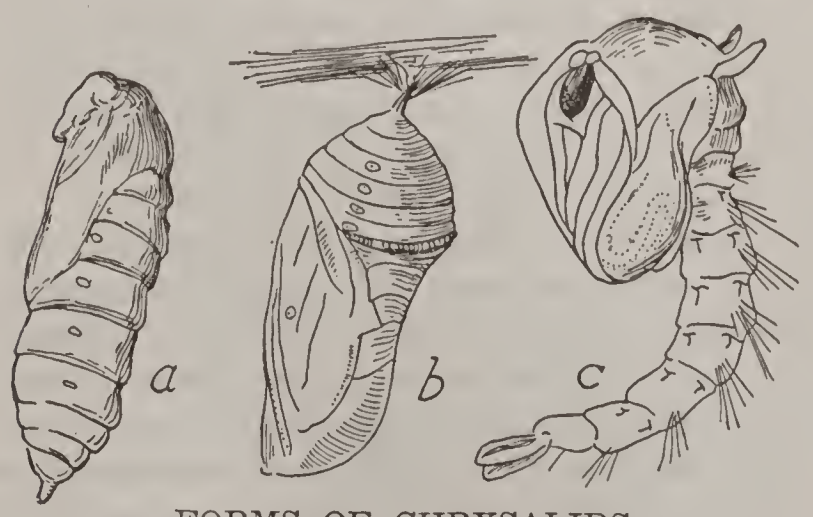
CHRONOLOGY, *kro nol'o ji,* the science of dividing time into periods and of giving to historic events their proper dates. The unit of time in chronology is the year. When the date of an event is given, we mean that such an event happened so many years after or before some great point in history, which is regarded as the beginning of an *era.*

We say that Columbus discovered America in A. D. 1492, meaning that he made his great discovery 1,492 years after the birth of Christ; A. D. is the abbreviation for the Latin expression *Anno domini,* meaning *in the year of our Lord,* and the birth of Christ is the beginning of the *Christian Era.* Dates of events occurring before the birth of Christ were written with the letters B. C.; as, Julius Caesar invaded Britain in 55 B. C. This system of fixing dates is the one now commonly employed throughout the enlightened parts of the world.

The Greeks reckoned time by the four-year intervals between the Olympic games, which were known as *Olympiads.* They began their era from a date which corresponds to 776 B. C. The Roman era begins with the founding of the city of Rome, 753 B. C. being the date generally accepted. Another important era is the Mohammedan, dating from Mohammed's flight from Mecca in A. D. 622 (see HEGIRA). The American and European year 1917 is therefore the Mohammedan year 1295. See CALENDAR; YEAR.

CHRONOMETER, *kro nom' e ter,* in a general sense, is any instrument that measures and records time. Thus, a clock, a watch, a sundial or any other device that does this is a chronometer. In a specific sense, a chronometer is an instrument made for very accurate and minute measurements of time. The one most widely known is the *marine chronometer,* which determines time in connection with finding longitude at sea. For this purpose it is set at the time of some first, or prime, meridian. Greenwich time is used by American and British ships; that of Paris, by the French, and that of Berlin, by the Germans. The mechanism of these instruments is very delicate and easily affected by outside influences; they must be kept away from the magnetic influence of compasses and from the vibrations of the ship. These chronometers are hung in their cases on gimbals so they may always be in a horizontal position. A pocket chronometer, which is used for railroad and racing purposes, looks like an ordinary watch, but is somewhat larger. It registers very small fractions of time.

CHRYSALIS, *kris' a lis,* the resting state of butterflies in the process of development, when



FORMS OF CHRYSALIDS

(*a*) Sphinx moth; (*b*) monarch butterfly; (*c*) mosquito.

they cease to be larvae (young), and before they reach their winged, or perfect state. This state in the lives of moths and many other insects is called the *pupa* stage. From a life of motion and plenty to eat, the worm or caterpillar builds itself into a shell-like house, or silky cocoon. Attached to a leaf, twig or fence, without food and merely breathing, it rests and develops until ready to burst forth a beautiful, quivering creature of the air, a perfect butterfly. The pupa, or chrysalis, usually takes the color of the object to which it is attached. See BUTTERFLY.

CHRYSANTHEMUM, *kris an' the mum,* a stately, free-blooming autumn flower, the national flower and imperial emblem of Japan. The story of the chrysanthemum is most interesting. In its natural state it is much like

CHRYSANTHEMUM

the aster—coarse-leaved, with rather common looking flowers, the ox-eye daisy and the corn marigold being two species. But as a result of care and cultivation the chrysanthemums of the gardens and hothouses to-day are gorgeous offspring of Chinese and Japanese varieties, with leaves pale green or dusty silver, and large, globelike, ragged-blossomed flowers of many forms and colors. Every year when the gray days come and other flowers have faded, in garden spots or florists' windows or under the glass of greenhouses the chrysanthemum, the "golden flower," affords a wealth of brilliant hues.

In the Imperial Gardens of Japan originated the custom of "chrysanthemum shows." Now each year in many countries, for several weeks at a time, rich and poor alike can feast on the sight of chrysanthemums—white or yellow, pink or purplish-rose and red, quilled or

twisted, solid or shaggy, single, double or semi-double—chrysanthemums in true pompon or button form and size, dozens of blossoms from one stem, or one wonderful showy eight-inch head topping one straight, sturdy stem. So from the dainty bamboo greenhouse, with its oiled paper roof, came the flower, fourth in commercial importance in the United States, $500,000 worth being used yearly.

CHRYSOSTOM, *kris'os tum,* JOHN, Saint (about 345-407), a beloved and manly Christian, one of the greatest and most celebrated of the early Church fathers, born at Antioch, Syria. He studied rhetoric with Libanius, the most famous orator of his time, and became so wonderfully eloquent that the name Chrysostom, meaning *the golden-mouthed,* was given him. Through the influence of his pious mother he determined to consecrate his life to God in the deserts of Syria. After six years spent in studying and meditating, he became ill and returned to Antioch. He was later ordained deacon and presbyter, and in 398 went to Constantinople. There he did so many things to lower expenses so there might be more to give to charity that he was called *John the Almoner.* He preached so much against worldliness that the emperor was displeased and banished him to the northeast shore of the Black Sea. He was obliged to make most of the journey by foot, bare-headed, in the burning sun. This exposure was too much for him to bear, and he died on the way. His festival is celebrated on January 27 in Roman churches, on November 13 in Greek churches. The *Homilies* he wrote on parts of the Scripture are considered the best in the ancient Christian literature.

CHURCH. When Jesus Christ was on earth He gathered about Him a body of followers who accepted His teachings and spread them after the Resurrection. Within a few years this organization which Jesus founded became known as the *Church.* The name comes from a Greek word meaning *dedicated to the Lord.* The Scotch *kirk* and the German *Kirche* come from the same word and possess the same meaning. In the Book of *Revelation* (which see) the Church is spoken of as the bride of Christ, meaning all who have become His followers. This makes the Church a spiritual body, and this is what the word means in its broadest sense.

During the time of the Apostles the name was applied to different groups of Christians, and some of Saint Paul's Epistles are addressed to these churches. In *Revelation,* also, the word is used in the same way, where the angel bids John write to the seven churches in Asia Minor. A third meaning of the word is a body of Christians having the same creed, as the Presbyterian Church, the Baptist Church and the Roman Catholic Church. In this sense the meaning is the same as *denomination.*

Finally, the name, as a common noun, is given to the building in which a group of people of the same faith worship.

For the history of the Christian Church down to the end of the Reformation see the articles ROMAN CATHOLIC CHURCH; REFORMATION, THE. After the Reformation the Protestant body divided into numerous branches, because of differences in regard to doctrine and worship. The important divisions of the Protestant group are treated in this work under their respective titles.

CHURCHILL, WINSTON (1871-), an American author who has written a series of historical novels and several noteworthy books dealing with live social and political issues in modern American life. He was born in Saint Louis, Mo., and was graduated in 1894 from the Annapolis Naval Academy. His first novel, *The Celebrity,* appeared in 1898, and was followed by three related historical tales that won him great popularity —*Richard Carvel, The Crisis* and *The Crossing,* tales of colonial and pioneer days. In 1906 came possibly his best achievement, *Coniston,* a finely-written story of New England local politics. *Mr. Crewe's Career,* another political novel, *A Far Country* and *The Inside of the Cup,* the last named a criticism of modern church methods, are his latest stories. His books are brightened by delightful humor, and he knows how to arouse the reader's interest. All of his novels show the results of sound, careful workmanship, and are uniformly clean and wholesome.

WINSTON CHURCHILL
American author.

Churchill has for several years taken an active interest in the politics of his home state, New Hampshire. In 1903 and 1905 he was

elected to the state legislature, and in 1912 was the unsuccessful candidate of the Progressive party for governor.

CHURCHILL, Winston Leonard Spencer (1874-), one of the best-known of the modern group of English statesmen, who though he began his Parliamentary career as a Conservative, rose to distinction in the House of Commons as a Liberal. He entered the army in 1895, saw service in India and in Egypt, winning a medal for gallant conduct in the Battle of Khartum, and during the South African War was correspondent for a London paper. Elected to Parliament in 1900, he soon cast in his lot with the Liberals, and in 1905, during the Campbell-Bannerman Ministry, became Parliamentary Secretary for the Colonies. From 1908 to 1910 he was President of the Board of Trade, in 1910 became Home Secretary, and in 1911 was appointed First Lord of the Admiralty in the Asquith Ministry, being one of the youngest men who ever held this office.

Though Churchill was an advocate of a strong navy, in 1913 he suggested to Germany the plan of a "naval holiday," each nation to cease adding to its navy for one year. The next year saw nearly all Europe involved in the greatest conflict of modern times, the War of the Nations. Churchill's conduct of naval affairs in the war, especially in connection with the campaign in the Dardanelles, caused much dissatisfaction, and when the Cabinet was reorganized in 1915 he was relieved of the navy portfolio. But that his great ability might not be lost to the Cabinet, he was appointed to the office of Chancellor of the Duchy of Lancaster. In November of the same year he resigned his Cabinet position and joined the army in France, but he retained his seat in Parliament. His writings include *The River War, My African Journey* and a biography of his father, Lord Randolph Churchill, who died in 1895. B.M.W.

WINSTON CHURCHILL
English author, soldier and statesman.

CHURCHILL RIVER, in Western Canada, with the exception of the Nelson River and its tributaries the greatest of the rivers which flow eastward into Hudson Bay. It is nearly 1,000 miles long, and its drainage basin, which is not sharply defined, includes about 115,000 square miles. Its source and the upper half of its course are very close to the low watershed which divides the Arctic rivers from those which flow into Hudson Bay. One of its northern branches rises in Lake La Loche, in Saskatchewan, about ten miles from the Alberta boundary. From this lake a portage of only twelve and one-half miles brings the traveler to the banks of the Clearwater River, whose waters find their way through the Mackenzie system into the Arctic Ocean. About 300 miles eastward on its course the Churchill seems to be in direct connection with the Mackenzie system, for it receives Reindeer River, issuing from Wollaston Lake, another part of whose surplus waters flow north and west, into Athabaska Lake.

Throughout its course the Churchill flows through many large and small lakes; in fact, it may be called a chain of lakes connected by narrow, rapid channels. For the most part the lakes and rivers are navigable for canoes, but there are many places where rapids and waterfalls make short portages necessary. In the early days of the Northwest, long before the coming of a railway, the Churchill was an important trade route. Its upper course, for a distance of 450 miles below Lake La Loche, was on the direct route of the trappers and voyageurs to the valleys of the Peace River and the Mackenzie. Along its banks the mink, otter, marten, fox and other fur-bearing animals are still trapped in large numbers, and its waters abound in fish. Fort Churchill, at the mouth of the river, is the best natural harbor on Hudson Bay. The river was named for John Churchill, first Duke of Marlborough, who was the third governor of the Hudson's Bay Company (see Marlborough, John Churchill).

CHURCH OF ENGLAND, the Church established by law to be the State or national Church of the English people. Its history properly begins in the sixth century, when Saint Augustine was sent to England by Pope Gregory the Great to convert the inhabitants to Christianity, and was appointed to be the first Archbishop of Canterbury.

Until the reign of Henry VIII the English Church was one of the branches of the great Roman Catholic organization, and the English sovereigns acknowledged the authority of the Pope. Henry VIII, though a believer in

Catholic doctrines, renounced his allegiance to the reigning Pope, Clement VII, when the latter refused to sanction his divorce of the queen, Catharine of Aragon. Parliament sustained the king by passing the Act of Supremacy in 1534, which declared Henry to be the supreme head of the Church, and made that organization legally independent of the Pope. A few years before this Martin Luther, in Germany, had started the revolt against the Roman Catholic Church known as the Reformation, and his ideas had begun to find favor with a large number of the English people. Protestantism, however, was not established without a severe struggle that lasted through the reigns of Edward VI, Mary and Elizabeth. In the Elizabethan period the English Church was definitely and forever separated from the Church of Rome, and the Thirty-nine Articles of Religion were put in their present form.

The Church of England claims to teach and uphold the doctrines of the Apostles, and to be a branch of the one universal Church of Christ. Its doctrines are stated in the Thirty-nine Articles, the Book of Common Prayer and the books of homilies. The Church has possession of the edifices, lands and other property granted it in former times, and is protected by law in the possession of these endowments. In civil matters it is under the jurisdiction of Parliament. Convocations of the clergy are called for the discussion of religious matters, and these often exercise considerable influence. A wide range of belief in matters of doctrine and forms of worship prevails at the present time in the Church, which is divided into three groups—the High Church, Low Church and Broad Church parties. The first group represents those who are nearest the Roman Catholic Church in doctrine and ritual; the second group, those who favor greater simplicity and are, in general, opposed to that which savors of the Roman worship; the third comprises those who are between the two extremes.

In regard to organization, the country is divided into two provinces, Canterbury and York. These are governed by archbishops, the Archbishop of Canterbury having jurisdiction over England as a whole. The provinces are divided into dioceses, over which are bishops. Next to the bishops in order of rank are the archdeacons and deacons, followed by canons, prebendaries, rectors, vicars and curates. The English clergy are supported neither by the State nor entirely by voluntary contributions of the Church members, but chiefly by endowments and bequests given by persons of means and liberality. The Church is exceedingly active in both foreign and home missionary work, the latter including service among soldiers, sailors, friendless boys and girls, and countless unfortunate and destitute persons.

The organization in the United States which most nearly corresponds to the Church of England is known as the Episcopal Church.

Related Subjects. A broader understanding of the history of the Church of England will result from reading the following articles in these volumes:

Archbishop	Catharine of Aragon
Articles, The Thirty-nine	Episcopal Church
Augustine, Saint	Reformation
Canterbury	Supremacy, Royal
	York

CHURN, a closed vessel in which butter is made. The kind of churn most familiar to older persons is the one yet used in many farm homes and small dairies. It is a wooden cylinder, tapering toward the top, where it is fitted with a cover. For agitating the cream a wooden dasher, attached to a vertical handle, is used; in the dasher there are a number of small holes. The handle passes through the cover and when it is moved up and down in the cream the dasher causes the particles of fat to separate and gather into lumps.

More modern churns are made in barrel form and are operated by a crank and given a rotary motion, which throws the butter on the sides of the barrel, from which it is easily removed. The establishment of creameries where steam power is used has made a great change in the size and kinds of churns used. One of these big churns combines the features of churn and butter-maker, the butter being at least partly worked after the buttermilk is drawn off. A device beginning to be much used is the churn and cream-separator combined, the sweet cream being churned as soon as separated. In order to produce well-flavored butter, churns should always be made of hard, well-seasoned wood, as soft woods impart a disagreeable taste.

MODERN SMALL CHURN

The earliest churns of which we have any record were made of goat-skins, with the hair side out, in which milk was agitated by swinging or beating until the butter was produced. See BUTTER.

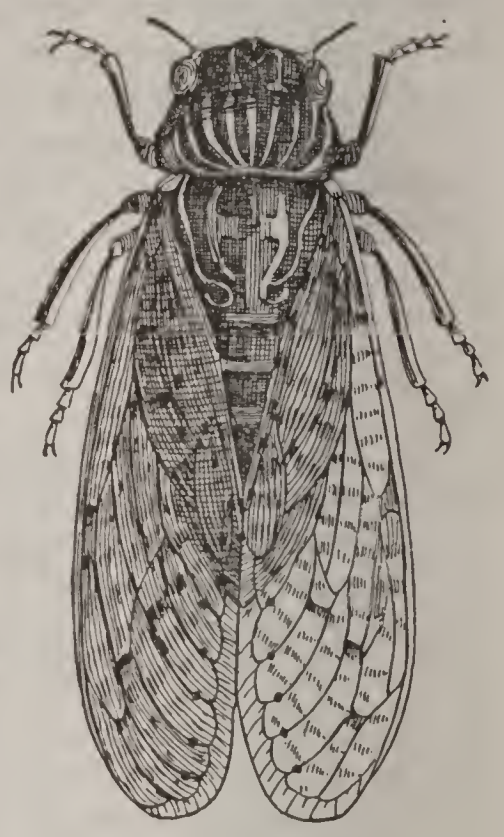
CHURUBUSCO, *choo roo boos' ko,* BATTLE OF, an important battle of the war between Mexico and the United States, fought on August 20, 1847. It was one of several victories gained by the American army of General Scott. Churubusco is a small village six miles south of the City of Mexico. Before sunrise the Americans had stormed the fortified camp of Contreras, and immediately afterwards they attacked the Mexican force of 30,000, under Santa Anna, at Churubusco. Many of these were stationed in a strongly-fortified convent with thick, massive walls. The fighting was desperate and lasted about three hours, when the Mexicans fled from their positions and sought refuge within the walls of Mexico City. About 9,000 Americans took part in the battle, losing, in killed and wounded, about 1,110. The Mexicans lost in killed, wounded and captured fully 7,000. This was next to the last engagement of the Mexican War; only Chapultepec was yet to be fought, as circumstances proved, before the Americans entered Mexico City and dictated terms of peace. See MEXICAN WAR.

CHYLE, *kile.* When the partially-digested food leaves the stomach it is mingled with three fluids in the small intestine—the bile, the pancreatic juice and the intestinal juice. The action of these fluids changes the food to a milky fluid called *chyle.* The chyle contains the portions of the food which nourish the body. Some of it is absorbed through the mucous membrane of the intestines directly into the blood, but those portions containing fat enter the blood through the lymphatics. See DIGESTION.

CHYME, *kime.* When food enters the stomach the walls of that organ contract in such a way as to impart a sort of churning motion to it. This continues until every portion of the food has been brought into contact with the gastric juice. This fluid reduces the food to a pulp called *chyme.* Chyme is grayish-white in color and looks like milk; but it is thick. The chyme passes through the pylorus into the small intestine, where it is changed to chyle. See DIGESTION.

CICADA, *si kay' da,* a large, noisy insect, one kind being known as *harvest fly,* another wrongly called *seventeen-year "locust."* In late summer "dog days" it is heard in the trees, making its peculiar rattling notes on the three drumlike membranes which are attached to the sides of its body and operated by special muscles. These notes issue only from the males, which live only a few days.

The females lay their eggs in the twigs of trees or shrubs, in small holes which they bore. The damage which they thus do to orchards is often considerable, for the boring of holes weakens the twigs, and they sometimes break off. The young drop to the ground soon after they are hatched, and for several years (see below) they live underground. How they continue to exist in that early stage is not well understood, but finally the pupa crawls out upon the trunk of a tree or a spear of grass, its skin splits open along the back, and the full-grown insect emerges. At first the wings are merely watery sacs, but in a very short time they expand to their full size. The black and green *harvest fly* is a two-year cicada, but the young of other cicadas live in the ground as larvae from thirteen to seventeen years; from this latter fact the name *seventeen-year locusts* is derived. The largest of the broods is due again in 1919, and then once more the sparrows will have a wonderful feast of *seventeen-year cicadas.* But before each brood dies it does great damage to growing crops.



THE CICADA

CICELY, *sis' e li,* or *sys' li,* an herb, some species of which, such as parsley, are used in soups and for garnishing. Sweet cicely, or sweet chervil, is a plant common in Great Britain and other parts of Europe. Its roots are spicy, and taste and smell like anise. Bees are said to like it, so empty hives are often rubbed with sweet cicely to attract a swarm. A species of sweet cicely is found in American woods from Canada to Virginia. See PARSLEY.

CICERO, *sis' e ro,* MARCUS TULLIUS (106-43 B. C.), an illustrious Roman orator and statesman who lived in the stirring times of

the declining republic, universally acknowledged to be "the most eloquent of the sons of Romulus." Born at Arpinum, of an ancient family of the order of knights, he was early sent to Rome to be educated. He completed his regular schooling with courses in law and philosophy, and also enjoyed a thorough training in the art of oratory. At the age of twenty-six he began his public career as a pleader in the law courts; after a period of travel, in which he visited the great centers of learning in Asia Minor and Athens, he returned to Rome and soon rose to first rank among the great orators at the Roman bar.

CICERO

Cicero was elected quaestor for the year 75 B.C. and was assigned to Sicily, where he so pleased the people by the just performance of his duties that in 70 B.C. they called upon him to conduct their suit against the robber-governor of the island, the infamous Verres. Though Verres employed the celebrated Hortensius to plead his cause, Cicero's first speech against him was such a triumph of oratory that he fled into voluntary exile. Cicero then rose rapidly in power and public esteem, gaining the consulship in 63 B.C., through successive steps. It was during his term as consul that he exposed the wicked conspiracy of Catiline (which see), and drove the traitor in shame from the Senate by his masterpiece of oratory known as *The First Oration Against Catiline.*

Cicero, then at the height of his power, was hailed as the "father of his country" and the "savior of the state," but there was to be a turn in the tide of his fortunes. Soon after he completed his term of office his enemies charged him with having executed the leaders in the conspiracy of Catiline without giving them a legal trial, and Publius Clodius, the tribune of the people, raised such a storm of popular indignation that Cicero was forced to go into exile, choosing Thessalonica as his place of refuge (58 B.C.).

Sixteen months later he was recalled to Rome. Events were moving rapidly forward toward the great struggle for the control of the Roman world, with Caesar and Pompey the leading men in the state. When Cicero returned from a year's administration of the province of Cilicia (50 B.C.) he found Italy on the verge of civil war. He gave Pompey his half-hearted support, and after the latter's crushing defeat at Pharsalia, fled to Brundisium to await the decision of Caesar concerning him. That great leader forgave him and treated him with great kindness, and after Caesar's assassination Cicero composed a series of orations against Mark Antony. These, the celebrated *Philippics,* were the cause of his downfall. When Antony, Lepidus and Octavius (later the Emperor Augustus) in 43 B.C. formed the second triumvirate, Cicero's name appeared on the list of those condemned to death, and while attempting to escape from his villa at Tusculum he was beheaded by a band of Antony's soldiers.

Cicero ranks among the greatest of the ancient writers, and his orations are unsurpassed in Roman literature for beauty of language and grace and eloquence of style. The four *Orations Against Catiline* are familiar to the high-school student of Latin. Among other writings are the fourteen *Philippics* against Antony, the essays on *Friendship* and *Old Age* and numerous charming letters that give a wonderful picture of the age in which he lived. W.L.W.

Related Subjects. For further investigation into the historical setting of Cicero's life, see the following articles in these volumes:

Antony, Mark	Consul
Catiline	Quaestor
Caesar, Caius Julius	Triumvirate

CID, *sid,* THE, the name applied in song and story to the great national hero of Spain, who lived in the latter part of the eleventh century. His real name was RODRIGO, or RUY DIAZ; "the Cid" comes from the Arabic *El Seid,* meaning *the lord.* He first appears in history in the reign of Ferdinand I, and under the successors of that monarch he won distinction as a great warrior. Banished from the realm by Alphonso of Castile, he began the adventurous career of a soldier of fortune, and for years battled for the Arabian kings of Saragossa in Northeastern Spain, fighting their Mohammedan and Christian enemies alike. In 1094 he made himself master of the city of Valencia. After five years of supremacy,

during which he assailed many a neighboring fortress, he died of grief on learning of the defeat of an army which he had sent against his Moorish enemies.

The Cid of romance and song, the type of all the manly virtues, is quite a different person from the adventurous Rodrigo of history. The greatest of the early literary works which celebrate his exploits is *The Poem of the Cid,* written about 1200, one of the best epics of medieval times. Nearly 200 ballads and innumerable stories and dramas have also been founded on legends concerning him, and he is the hero of a famous tragedy, *The Cid,* by the French dramatist Corneille.

CIDER, *si'der,* commonly the sweet or fermented juice of apples, although sometimes made of pears or of oranges. Late apples produce the best cider, and red ones are better than the green or yellow. The apples are crushed until reduced to a pulp. The juice is run into casks or barrels, and exposed to the air until it ferments, and a clear amber or light brown liquor, or "hard cider," is produced. If sweet cider is boiled and bottled it will keep fresh a long time. Sweet cider contains no alcohol and is therefore not intoxicating. But the longer it stands in the barrel the more it will ferment and the more alcohol will be produced. The accumulation of alcohol in "hard" cider makes it very intoxicating. It may contain as much as eight per cent of alcohol—as much as a strong wine. Cider brandy, or *applejack,* is distilled from fermented cider. *Apple butter* is made by stewing apples in fresh cider. *Cider vinegar* is made by allowing cider to remain exposed to the air until the alcohol is changed into acetic acid (see VINEGAR; ACETIC ACID).

The greatest cider-producing country in the world is France. In the United States 1,500,000 to 2,000,000 barrels of it are produced each year, New York, Pennsylvania, Ohio and Indiana pressing the greatest quantities. The industry is also important in England and Germany. J.F.S.

CIENFUEGOS, *syen fway'gose,* one of the most progressive cities of Cuba, overlooking the Bay of Jagua, on the south coast of the island, in the province of Santa Clara, 130 miles southeast of Havana. It is the fourth commercial port of Cuba and an important center of the trade in sugar, wax and timber exports, in value over $5,000,000 annually. During the Spanish-American War the harbor was blockaded by Admiral Schley. The climate in winter is very agreeable, but the summer is by no means healthful, the temperature for days at a time being above 98° F. The total population in November, 1919, was reported as 95,865, of whom only 30,000 are white.

CIGAR, *si gahr'.* See TOBACCO.

CIGARETTE, *sig a ret',* a small, pencil-shaped roll of tobacco in a covering of paper, used for smoking. By many authorities cigarette-smoking is regarded as the most injurious form in which tobacco can be employed, and it is particularly harmful to young persons. The smoke in the mouth mixes with the saliva, to which it imparts certain poisonous properties arising from combustion of paper and tobacco, which prevent the natural assimilation of food. Nervousness, loss of sleep and often serious affections of the heart and throat and disorders of the stomach are among the evil results of excessive cigarette smoking. There is a very general tendency among the enemies of cigarettes to call them "coffin-nails." In 1920 there were 54,287,000,000 of them made in the United States.

During recent years a strong crusade has been conducted against cigarette smoking, and free medical advice is given to those who suffer from its effects. Two kinds of treatment endorsed by the Anti-Cigarette League of America are given below:

(a) Six ounces of silver nitrate solution (one-fourth of one per cent). Use as a mouth wash after every meal, for one week, if necessary. Do not swallow any of the solution. Keep it in a colored bottle. The cost should not exceed twenty-five cents.

(b) Gentian root (not the powder) should be chewed between meals. It is slightly tonic, is an aid to digestion and may be used for several weeks without injury.

The diet for the first two weeks consists exclusively of fruits, well-baked cereal foods and milk. The best cereal foods are Shredded Wheat Biscuits, Corn Flakes, Puffed Rice, Puffed Wheat, etc., used with cream and milk. Whole wheat or rye bread, etc., may also be used. The moderate use of nuts, well masticated, is of value. Eggs and cottage cheese may also be used. At the close of each meal use fresh sub-acid fruits, as peaches, pears, apples, pincapples, etc. Sweet milk, buttermilk, or salted milk may be used in place of tea or coffee.

While irritating and stimulating foods and drinks intensify the craving for tobacco, a grain, milk and fruit diet lessens it. In some special cases an entire milk diet for a few days may be beneficial; especially if there exists an irritable stomach bordering on ulceration, with an excess of hydrochloric acid. Where the digestion is slow, and there is a deficiency or absence of free hydrochloric acid, a diet composed entirely of fresh fruits for a day or two preceding the grain, fruit and milk diet may be of benefit.

Eliminative baths, preferably the Turkish bath, will assist in rapidly getting rid of the stored-up nicotine.

As a rule, it takes from three to six weeks to eliminate entirely the desire for tobacco. The time required depends upon how closely the directions are followed. Still more complete directions for dealing with the habit may be secured by addressing the Anti-Cigarette League of America, Chicago, Ill. See ANTI-CIGARETTE LEAGUE.

The makers of cigarettes in the United States are obliged to pay an internal revenue tax to the government, varying from fifty-four cents to $3 per thousand. In Canada the tax, there called an excise tax, ranges from $2.40 to $7.00 per 1,000 cigarettes, according to the size.

CILIA, *sil'e a.* If we could examine with a microscope the small air passages in our lungs when they are in action, we would see that the inner surface is covered with tiny hairlike bodies that are constantly in motion, and that their movement resembles that of a field of grain when the wind blows upon it. These tiny bodies are *cilia,* and in the air passages they cause a continuous current of air to flow in the same direction. Cilia are found in the nasal passages, except where the olfactory nerve is distributed, in the internal ear, in the larynx, on the palate and in all the small air passages in the lungs. See BRONCHITIS; LUNGS.

CIMBRI, *sim'bri,* a warlike people of the Teutonic race, who, with the Teutons, formed the vanguard of the great German migration that so profoundly affected Roman history. In the year 113 B. C. the Cimbri began a southward movement through the forests of Germany, meeting a Roman army near Noreia, in modern Carinthia, and winning there a great victory. After several years of wandering, during which they defeated two Roman armies, they appeared in Gaul, and were joined there by the tribe of Teutons. This great host then began a southward movement toward Italy, dividing into two sections. The Cimbri planned to cross the Eastern Alps and to join the Teutons in the Po valley; the latter were to make their way through the Western Alps.

The Romans, terrified at the danger which threatened their city, had placed their great general Marius at the head of their legions to check the invading hordes of barbarians. Marius hurried to Southern Gaul, where he totally routed the Teutons at Aquae Sextiae (Aix), in 102 B. C. He then recrossed the Alps to intercept the Cimbri, who were pouring into Northeastern Italy, and in a terrible battle near Vercelli (101 B. C.) annihilated them. Over 100,000 were slain, and 60,000 were taken captive and sold as slaves. In the words of the historian Mommsen, "The forlorn hope of the German migration had performed its duty; the homeless people of the Cimbri and their comrades were no more." See MARIUS, CAIUS.

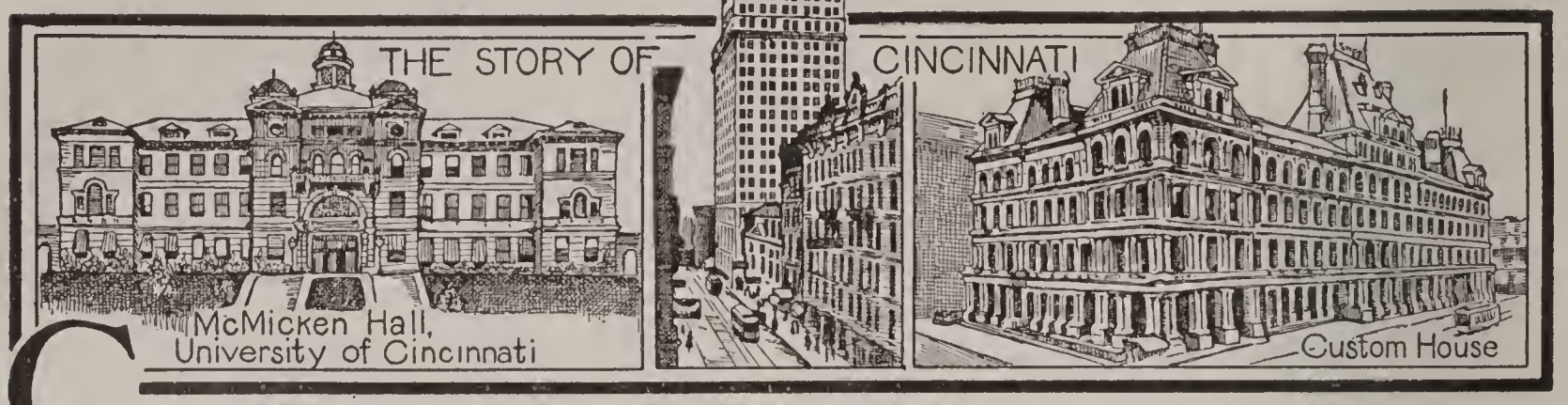
CIMON, *si'mon* (? -449 B. C.), a famous general and statesman of ancient Athens, the son of Miltiades, hero of the Battle of Marathon. He distinguished himself at the great naval battle at Salamis (480 B. C.), during the second invasion of the Persians, and rose to the chief command of the Athenian fleet. In 466 B. C., at the mouth of the River Eurymedon, he defeated the Persians both on land and on sea, destroying 200 of their fleet of 350 vessels. Cimon soon became the most influential man in Athens, but his policy of seeking the friendship of Sparta aroused the opposition of the democratic party, led by Pericles, and in 461 B. C. he was ostracized. After his recall from exile he again led the Athenian fleets against the Persians, and died while besieging the Persian garrison of Citium in Cyprus. See OSTRACISM.

CINCHONA, or **CHINCHONA,** *sin ko'na,* an important tree, shrub or plant, from the bark of which the valuable quinine and cinchona are obtained. These trees, or plants, are all evergreen, with simple, opposite leaves, and white, rose-colored or purplish, fragrant, lilac-like flowers. The bark is taken off in strips, longitudinally. At one time the cinchona trees were cut down to obtain the bark, but less wasteful methods are now used to obtain an increased yield. Cinchona plants have been taken from Peru, their native home, and they

CINCHONA

Appearance of tree, or plant; leaves; blossoms, and detail of blossom.

are now grown in large plantations in Ceylon, India, Java and other tropical countries, where their cultivation has been encouraged by the British and Dutch governments. The Countess del Chinchón, wife of the viceroy of Peru, was cured of an obstinate intermittent fever by the use of this Peruvian bark; so her name was given to it. Later the Jesuits spread its use, so it is often called *Jesuits' bark*. About 4,000,000 pounds of cinchona bark are imported each year by American druggists. A number of substitutes and adulterants are placed on the market. See QUININE; PERUVIAN BARK.



CINCINNATI, *sin si nat' i,* OHIO, one of the great commercial and manufacturing cities of the United States, in population ranking second in its state (after Cleveland), and sixteenth in the Union. It is the county seat of Hamilton County, and is in the southwest corner of the state on the Ohio River, eighty miles northeast of Louisville, 120 miles southwest of Columbus, the capital, and 300 miles southeast of Chicago, by rail. Louisville is 138 miles distant by water. Germans form the greater part of the city's foreign element, which is twenty-one per cent of the total population; in 1920 the inhabitants numbered 401,158, an increase of 37,567 since 1910. The area exceeds sixty-eight and one-half square miles.

Cincinnati is one of the important commercial gateways of the country, having the service of the following transportation lines: the Cleveland, Cincinnati, Chicago & Saint Louis; Baltimore & Ohio Southwestern; Chesapeake & Ohio; Queen & Crescent; Louisville & Nashville; Cincinnati, Hamilton & Dayton; Cincinnati, Lebanon & Northern; Cincinnati, Indianapolis & Western; Erie; Norfolk & Western; Cincinnati, Georgetown & Portsmouth; Pittsburgh, Cincinnati, Chicago & Saint Louis; and the Cincinnati Southern. The last named is 335 miles long, was built and is owned by the city, and is operated under lease by the Queen & Crescent Route. Besides the service of these roads the city has nine interurban railways. Since the advent of railroads river transportation has declined; the latter is used now only for heavy freight like coal, lumber and iron.

Location. Cincinnati is built on the north bank of the river, which here sweeps in a wide curve to the south, and it is surrounded by a semicircle of hills. From the river the city rises in two great terraces, the lower one about sixty-five feet above low water, and containing the wholesale and manufacturing houses, and the second one from 50 to 100 feet higher, reserved for the closely-built business section. The thickly-wooded crests of Mount Lookout, Mount Adams, Mount Auburn and Fairview Heights, from 150 to 300 feet higher yet, afford a magnificent view of the river and undulating country and lend a picturesque aspect to the Vernonville, East Walnut Hill and Avondale, with that of any other city in the United States. The districts of Clifton, Rose Hill, Vernonville, East Walnut Hill and Avondale, with their fine avenues, lawns, gardens and residences, are especially attractive. These hilltops are reached by roads and inclined-plane cable railways.

Clustered about the city are a number of suburbs, Norwood, Walnut Hills, Ludlow, Milldale, Bellevue, Linwood, Elmwood and others, and across the river in Kentucky are Dayton, Covington, Newport and Latonia, with its noted race track—all cities of considerable size in themselves, and easily reached by interurban and street railways. "Over the Rhine," a section lying north and east of the canal which crosses the terrace at the base of the suburban hills, is largely occupied by Germans. The river is spanned by five bridges, one exclusively for railway traffic, two for highway and two for both. The large wire suspension bridge, with a span of 1,057 feet, is said to be the first bridge of its kind built in the United States (1863); the Cincinnati Southern bridge has one of the largest truss spans in the world.

Parks, Boulevards and Squares. The streets and avenues of Cincinnati average sixty-six feet in width and cross each other at right angles in the old portion of the city. As they approach the higher sections they become more irregular and conform to surface condi-

METROPOLITAN DISTRICT MAP

1. Green
2. Delhi
3. Covington
4. Newport
5. Columbia
6. Mill Creek

tions. Of the seventy-seven parks, whose combined area is 2,500 acres, Eden Park (210 acres) on Mount Adams is the largest. It contains the Art Museum and Art School and the two main city reservoirs, which appear as two beautiful lakes; its imposing entrance, Elsinore Gateway, is the reproduction of a medieval structure. Burnet Woods (160 acres) includes the grounds of the University of Cincinnati. Ault Park, Blackly Farm and Mount Airy Forest are among the other recreation grounds, and besides these there are twenty-four well-equipped playgrounds and a fine baseball park.

The Zoölogical Garden comprises sixty acres of natural hills, dales and ravines, and contains a great variety and a large number of animals. Spring Grove, the most noteworthy of the city's twenty-six cemeteries, covers 600 acres and is approached by an avenue 100 feet wide. Tyler-Davidson Fountain on Fountain Square is the city's most conspicuous ornament. It was cast at the Royal Bronze Foundry in Bavaria and cost over $200,000. Fountain Square is the meeting point for more than fifty street- and interurban-railway lines. The statues of Abraham Lincoln, William H. Harrison and James A. Garfield, former Presidents of the United States, and the Fort Washington Monument are also works of artistic merit.

Buildings. Most imposing of all the city's fine, substantial buildings is the United States Government Building, which was erected in 1880 at a cost of $6,000,000. The county courthouse, with the jail, occupies a square; the city hall, completed at a cost exceeding $1,000,000; the old and new city hospitals; city workhouse; Masonic and Odd Fellows' temples; the Central Union Depot; the Hughes High School; the buildings of the University of Cincinnati and the new Memorial Hall are all noteworthy. The Union Central Life Insurance Building, in which the Chamber of Commerce has its home, is a thirty-four story structure and is the tallest building in the United States between New York and Seattle, Wash. It is shown in the illustration heading this article. The city also has a number of fine bank buildings, and several office buildings of the "skyscraper" class.

The most prominent religious building is Saint Peter's Roman Catholic Cathedral, an immense structure with a stone spire 224 feet high; Murillo's original *Saint Peter Delivered* is its altarpiece. Saint Francis de Sales, Saint Paul's Methodist Episcopal, Saint Paul's Protestant Episcopal, First Presbyterian and Second Presbyterian churches and the Jewish Synagogue are structures of unusual architectural beauty. Of the city's twenty-four hotels the Sinton, Gibson (rebuilt in 1914), Lackman and Metropole are perhaps the most widely known. The Music Hall, also used as an exposition building, has a seating capacity of 5,400, and its organ is one of the largest in the United States.

Institutions. The public school system of Cincinnati offers opportunities for higher education through its capstone institution, the University of Cincinnati (an outgrowth of McMicken University), the only university in the United States conducted as part of the public school system; it has law, medical, dental and coöperative engineering departments and an observatory at Mount Lookout (see CINCINNATI, UNIVERSITY OF). There are six high schools, a school for deaf mutes, several scores of parochial schools, Saint Joseph's and Saint Xavier's colleges, Lane Theological Seminary, Ohio Mechanics' Institute, six Roman Catholic schools for young ladies, Hebrew Union College (the principal one in the United States for the education of rabbis), commercial colleges, conservatories of music and a fine public library containing 300,000 volumes. The city has more than fifty benevolent institutions and associations, including Saint Mary's, Good Samaritan, Jewish, United States Marine and the city hospitals, Longview Asylum, Ohio Hospital for women and children, homes for the aged, the friendless and the infirm, and asylums for orphans.

Commerce and Industry. Cincinnati is advantageously located to bid for business from the Ohio and Mississippi valleys, and with Lake Erie through the Miami Canal. Its commerce has been further increased by the construction of the Fernbank Dam. This was built at a cost of $1,300,000, and at the time of its completion in 1911 was the largest movable dam in the world. The manufacturing and commercial interests are large, the total output of manufactures being estimated at $260,000,000 annually. There are more than 2,800 manufacturing houses, the more important products of which are soap, machine tools, wood-working machinery, playing cards, printing ink, sectional office furniture (bookcases, etc.), and trunks. The city is noted as a hardwood lumber center, also for its exquisite Rookwood pottery. If the city has a single paramount industry it is the production of iron, including pig and ornamental iron, castings and foundry and machine-shop products. Formerly slaughtering and pork packing was the leading industry, but though still extensive, it is not so great as formerly.

History. When the site occupied by Cincinnati was first visited by the white man it was thickly dotted with the ancient works of the Mound Builders. In 1780 George Rogers Clark built two blockhouses here, but the permanent settlement was made in 1788 when a party from Kentucky and New Jersey settled on ground purchased by John Cleves Symmes and others. The village was organized by Israel Ludlow and called Losantiville, a name taken from the Latin and French and meaning *city opposite the mouth of the Licking*. Fort Washington was erected in 1789. In 1790 General Arthur Saint Clair outlined Hamilton County and made the new town its seat, changing the name to Cincinnati, in honor of the Society of the Cincinnati, a celebrated society of Revolutionary soldiers, of which he was a member (see CINCINNATI, SOCIETY OF THE). In 1802 the village became a town, and when incorporated as a city in 1819 it had a population of 7,500. After the opening of the river to navigation in 1816, the construction of the Miami Canal (1827) and the building of railroads, the growth of the city was so rapid that it was given the popular name of *The Queen City of the West*. Between 1840 and 1860 Germans were attracted to Cincinnati in large numbers and at that time comprised about one-fourth of the population.

CINCINNATI IN 1789
When Fort Washington comprised almost the entire settlement.

Several times the city has been visited by floods, the overflow of 1832, when the lower part of the city was submerged, being the most destructive. Previous to the War of Secession the place was frequently in a state of turmoil over the abolition movement; anti-negro riots were frequent, and the Philanthropist press, established by James G. Birney, was destroyed by mobs in 1836. During the war the city was the harbor for slaves seeking refuge in Canada. In 1862, during the "siege of Cincinnati," it was placed under martial law by General Kirby Smith. The most noted event of its later history was the "Cincinnati Riot" of 1884, when an infuriated mob broke into the jail and attempted to lynch some prisoners who had received undue mercy in the courts. The courthouse was burned, with some of the adjoining buildings. The Centennial Exposition of the Ohio Valley, held in 1888, celebrated the one hundredth anniversary of the settlement of the city.

Features of special interest in the locality are Fort Thomas, above Newport, Ky., one of the important army posts of the United States; and Fort Washington, built by the national government in 1789. The latter became the home of Lyman Beecher; there his daughter, Harriet Beecher Stowe, dwelt while collecting material for her book, *Uncle Tom's Cabin,* and there she met the originals of the characters in her celebrated story. On Mount Adams, in 1843, John Quincy Adams laid the corner stone of the Cincinnati Observatory, which was the first observatory erected in the United States. C.R.H.

CINCINNATI, SOCIETY OF THE, a patriotic memorial society, organized by officers of the Revolutionary army, American and foreign allies, to perpetuate the remembrance of the war and the mutual friendships "formed under pressure of common danger." It was organized May 13, 1783, while the Continental army was at Fishkill, on the Hudson River. Like Cincinnatus (which see), they had left the plow to serve their country and were returning to

it when the need was over, so they selected the name in his honor. All Continental officers who had served three years or who had been honorably discharged were accorded membership, and also the male descendants of such officers.

BADGE OF THE SOCIETY

The society had thirteen branches, one in each of the original states. The first meeting was held at Philadelphia in May, 1784, with George Washington as president. There was much opposition to the society, it being believed that the idea of membership through heredity opposed the principle of democracy upon which the republic was organized. It is interesting to note that in 1789 the Tammany Society was organized in New York as a body in which equality should govern, not right of birth. Continued opposition caused the decline of the Cincinnati, and for many years after 1830 it was practically out of existence. A revival began in 1893, however, and in 1902 all of the old state societies were again active.

CINCINNATI, University of, the only university in the United States strictly under the control of a city. In 1858 Charles McMicken left a fund of $1,000,000 for the founding of a city college in Cincinnati, but as the will was not held valid by the state of Louisiana, in which a part of the estate was located, the university was not established until 1870, when the legislature passed a special bill for its organization. The institution was opened for instruction in 1873, and it now occupies several handsome buildings in Burnet Woods Park, on a campus of forty-three acres. It comprises the colleges of liberal arts, engineering, law and medicine, a college for teachers, a graduate school and a technical school, and has affiliated with it the Clinical and Pathological School of Cincinnati and the Ohio School of Dentistry. Except for small fees, the university admits students who reside in the city without payment of tuition. There are about 300 instructors, and more than 3,100 students are enrolled. The institution is supported by the city by public taxes, by the income from the original endowment and by voluntary gifts.

In several ways the city and the university are directly related. In 1912 a Bureau of City Tests was established in the college of engineering, in connection with the engineer's office of the city Department of Public Service. The bureau makes all the tests of materials and supplies required by this and other city departments, and a technical chemist is employed to direct the work. A Municipal Reference Library, with quarters in the city hall, was organized in 1913 under the department of political science of the college of liberal arts. The library contains material relating to all phases of city government and municipal activities, and is open not only to the members of the city council and the administrative officers of the city, but to the student body and to the general public. Another valuable feature of the university administration is the coöperative system in the college of engineering, whereby students alternate their university studies with practice work in shops and factories.

CINCINNATUS, *sin si na' tus,* Lucius Quinctius, a virtuous, simple-mannered hero of the early days of the Roman Republic. He was an unyielding patrician and violently opposed all attempts at the equalization of patrician and plebeian. About 460 B.C., so the story runs, when the consul Minucius was surrounded by the Aequians, the Senate sent messengers to summon Cincinnatus to the dictatorship. Rich though he was, the messengers found him plowing his farm. At the call he hurried away, rescued the army, marched to Rome laden with spoils, and after sixteen days of dictatorship quietly returned to his plowing. At the age of eighty he was again appointed dictator to suppress the ambitious plebeian Maelius. See Cincinnati, Society of the; also Patrician; Plebeian.

Cincinnatus of the West. George Washington, like Cincinnatus, left comfort and home when his country called, and when the war was over, during which he became one of the commanding figures of the world, returned modestly to the affairs of his Mount Vernon homestead. So Lord Byron called him the *Cincinnatus of the West,* and the distinction caught the popular fancy.

CINDERELLA, *sin der el' a,* the beautiful, mistreated heroine of a fairy tale that has been the delight of children of almost every land. The story of the ragged little girl who was ridiculed by her proud stepmother and jealous sisters as she sat amidst the ashes and cinders in the chimney-corner, and who through a fairy godmother finally married the prince of the realm because she was the only maiden in the land who could wear the wonderful glass slipper, is a children's tale of absorbing interest. Long before the Christian Era a version of the story of Cinderella was known by the Egyptians, and they wrote it in their strange characters for their children to read; it was familiar also to the Greeks. It may be found among the German folk-lore tales of the sixteenth century, and in the delightful collections of fairy stories for which we are indebted to the Brothers Grimm.

THREE EPISODES IN THE STORY OF CINDERELLA

Cinderella in her corner is visited by the fairy godmother. At the prince's ball, from which she escaped on the stroke of midnight, losing the wonderful slipper. After tireless search the prince discovered that the slipper belonged to Cinderella, much to the dismay of her scheming sisters.

The various English versions are adaptations of the narrative of Charles Perrault, a famous French writer of fairy tales. He called his story *Cendrillon,* and in it used the expression *pantoufle en vair,* meaning *a fur slipper.* The early English translators mistook the term *en vair* for *en verre* (of glass), and so the glass slipper of Cinderella is really an erroneous feature of the story. However, it has become so vital a part of this loved tale that English readers will always believe that it was a glass slipper through which the "cinder-girl" became the bride of a prince.

Any bookstore can furnish the story in full at a cost of a few cents.

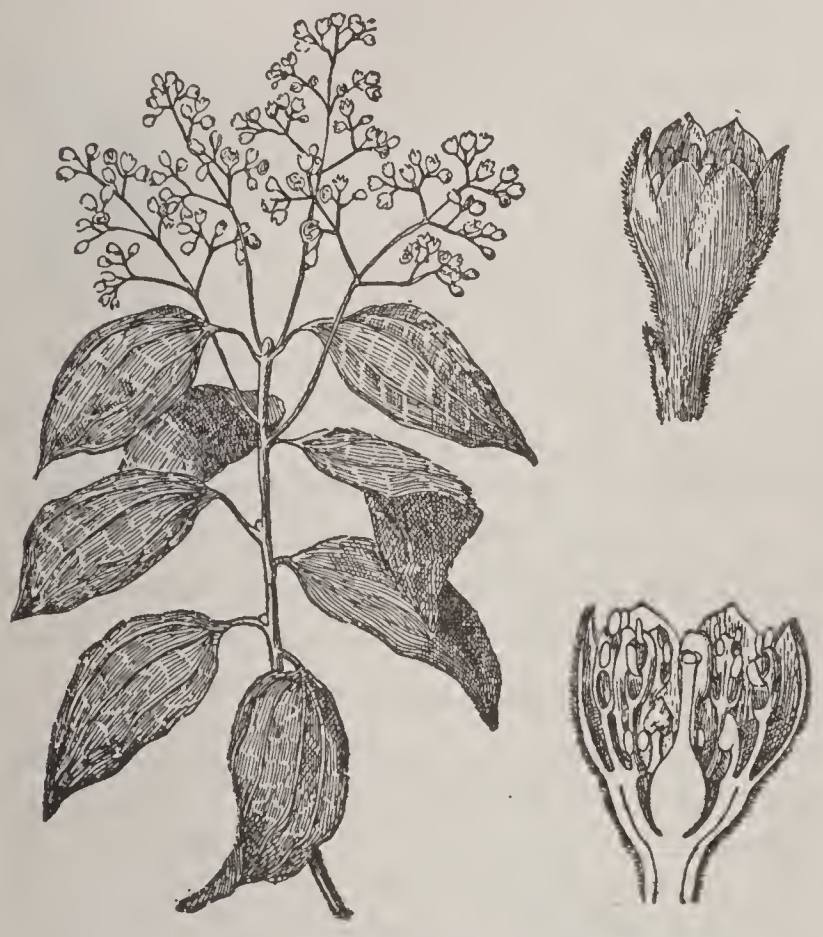
CINERARIA, *sin e ra' re ah,* a family of popular greenhouse herbs or small shrubs whose lower leaves have an ashy appearance; hence the name, from the Latin word for *ashes.* Although natives of South Africa, a number of species are cultivated throughout the world for garden purposes, and from these an almost endless variety of blossoms of many different colors have been produced. Purple, red, and purple and white are the prevailing colors; in early spring the dark-eyed, aster-like flowers with velvety leaves are in park conservatories. They are easily grown from seed and make beautiful window-garden plants.

CINNABAR, *sin' na bahr,* the most important mercury ore. It is a very heavy mineral, composed chiefly of mercury and sulphur. Although usually found in a granular, bright-red earthy form, it is sometimes obtained in crystals, and is abundant in Spain, California and China. Artificial cinnabar, formed by purifying a mixture of sulphur and mercury, is brighter in color than the true cinnabar, and is used for paint under the name *vermilion.* See MERCURY.

CINNAMON, *sin' na mon,* a delightfully-fragrant spice used in cookery and known since Biblical times. It is the inner bark of the under branches of a species of laurel, chiefly found in Ceylon, but growing also in Malabar and other parts of the East Indies. The tree reaches a height of twenty or thirty feet, has oval leaves, pale yellow flowers and acorn-shaped fruit. The Ceylonese bark their trees in April and November. In the process of drying the bark turns to a soft light-brown color and curls up into rolls or quills. The smaller quills are placed in the larger ones for shipping. Tasters assort them as to quality,

and they are made into bundles weighing about ninety pounds, ready for the market.

An oil of cinnamon is prepared in Ceylon, but the oil of cassia is generally substituted for it. Indeed, because of the wide use of cinnamon in the countries where it is grown,



CINNAMON
Leaves, detail of flower, and fruit.

the cassia bark is often substituted for cinnamon, to which it has some resemblance. The leaves, the fruit and the root of the cinnamon plant all yield oil of considerable value. That from the fruit, being highly fragrant and thick, was formerly made into candles for the sole use of the king of Ceylon.

CIRCASSIA, *ser kash'i a,* a name formerly given to the northwestern part of the Caucasus lying between the mountains and the Black Sea. It now forms a part of Caucasia, one of the great political divisions of Southern Russia. Although an old country, Circassia's chief historic interest lies in the struggle to free itself from Russian rule, which lasted from 1829, when, by the Peace of Adrianople, it was ceded to that country, until 1864, when its conquest by Russia was complete. After this the defeated people emigrated to Turkey in such great numbers that the land was almost depopulated.

Circassians. The name *Circassian* applies more particularly to the tribes in the Western Caucasus called Tcherkesses by the Russians and Turks, but Adighes by themselves. As a people they are remarkable for their warlike character, but they possess simplicity of manner and beauty of form and feature. In these respects they surpass all other tribes in the Caucasus. "Circassian belles" are often referred to when standards of beauty are discussed, and with reason, for this part of the world is famous for its handsome women.

Although the Circassians are said to have fine mental qualities, they have no written language, but depend on their memories for transmitting from one generation to another their wisdom and knowledge and memories of warlike deeds expressed in verse. This was the custom of people in ancient times. They are for the most part a sturdy and upright race, their great fault being the sale of their daughters to the harems of Turkey and Persia. In religion the upper classes are Mohammedans, but the lower classes practice a curious mixture of paganism and Christianity.

CIRCE, *sur'se,* in Greek legend a beautiful sorceress, said to have been the daughter of Helios and the sea nymph Perse. For the murder of her husband she had been banished to the island of Aeaea, on the coast of Italy. Thither she lured unfortunate travelers, and by means of drugs and enchantments changed them to animals. While Odysseus (Ulysses) and his companions were seeking their way home to Ithaca after the fall of Troy, they came to the island of Circe, where all the companions fell under the spell and were changed to swine. Odysseus himself escaped by using the herb given him by Hermes, and he compelled Circe to restore his companions to human form. The best-known story of Circe is to be found in the *Odyssey* of Homer. See MYTHOLOGY; ODYSSEY.

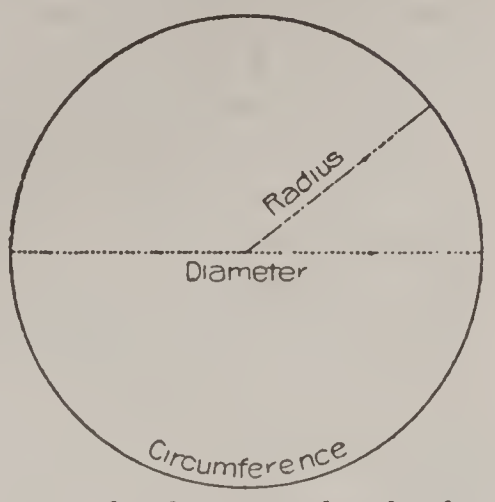
CIRCLE, *sur'k'l.* A circle is a plane figure bounded by a curved line, all points of which are equally distant from a point within, called the center.

Parts of a Circle. *Circumference.* The line which bounds the circle is called the *circumference,* and in popular usage the circumference is often called the circle. In geography we speak of the equator as a circle, and the meridians and parallels as circles, but in mathematics the *surface* bounded by the circumference is the circle.

Radius. The distance from the center of the circle to its circumference is called the *radius.*

Diameter. A straight line passing through the center of a circle and terminating at both ends in the circumference is called the *diameter,* a term derived from a Greek word mean-

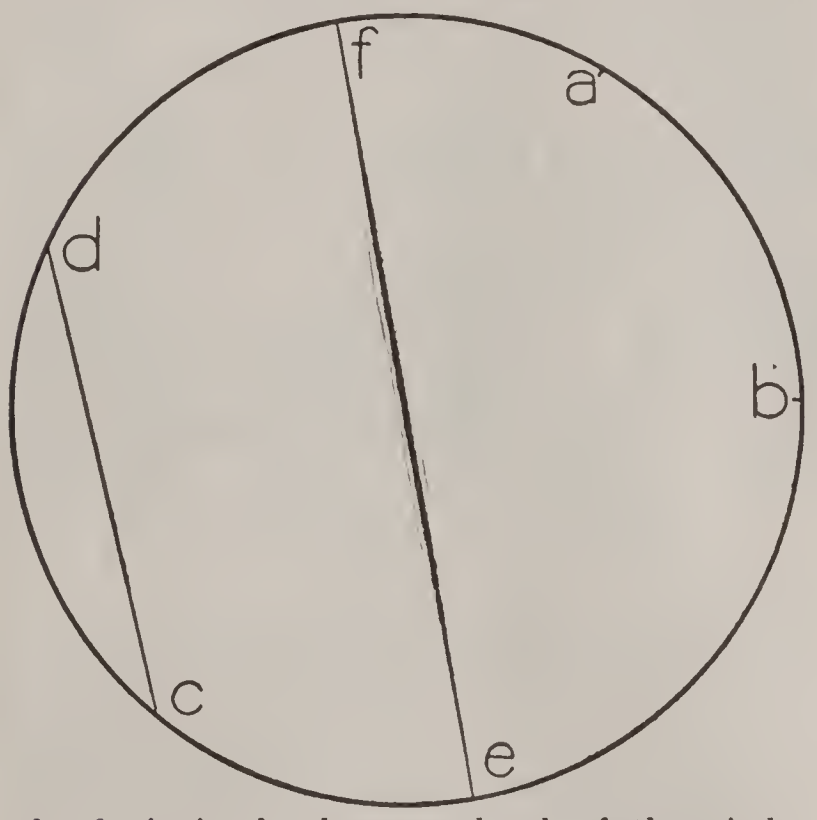
ing *measure through*. The radius is one-half the diameter. Any diameter of a circle divides the circle into two equal parts.



Arc. Any portion of the circumference is called an *arc*.

Chord. A straight line passing through a circle and terminating at both ends in the circumference is called a *chord*. A diameter is the longest chord of a circle.

The curved line *ab* is an *arc*. The straight line *cd* is a *chord*. The straight line *ef* is a



chord; it is the longest chord of the circle, being a diameter.

Relation of Circumference to Diameter and Radius. Measure the circumference of a circle; then measure its diameter; for example, the circumference and diameter of a cylindrical drinking glass; of a round dining table; a bicycle wheel or wagon wheel; a barrel head, and so on. By these measurements you will discover an interesting fact, namely, that there is always the same relation between the circumference and the diameter of a circle. Your measurements must be carefully made to get this relation. You will see very roughly at first that the circumference is *3 and some fraction* times as great as the diameter. With close work you will find the relation to be about 3⅐. The fact has been proved that the circumference is 3.14159+ times as great as the diameter. The decimal has been carried out very many places, but for most practical uses 3.1416 is used. We state this fact in mathematics in this way:

$$\text{Circumference} = 3.1416 \times \text{diameter}$$

or

$$c = 3.1416 \times d$$

or

$$c = \pi \times d$$

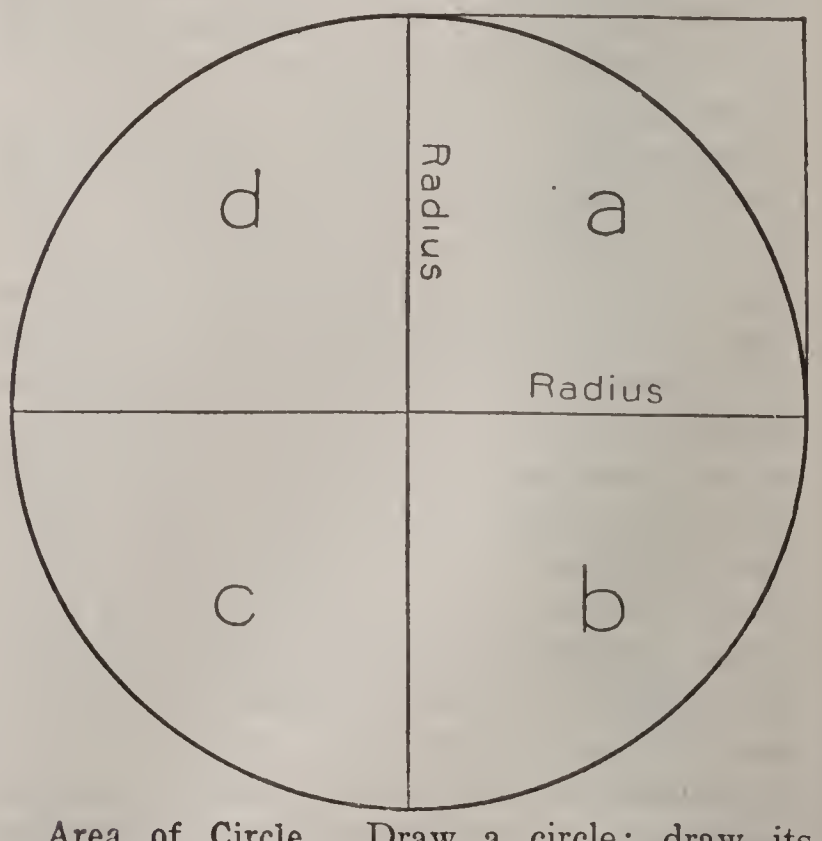
In the last equation we use the Greek letter π (pi) to stand for the number 3.1416. We always find that mathematicians, when they have to use a certain number many times, find or invent some symbol for it, and so they have chosen the symbol π to mean 3.1416 or the relation of the circumference to the diameter of a circle. This relation is very generally expressed in terms of radius instead of diameter, and the desirable formula to remember is

$$\text{Circumference} = 2 \times \pi \times \text{radius},$$

using 2×radius instead of diameter. It is shortened to this form by omitting the times signs:

$$\text{Circumference} = 2\pi r$$

Many ancient peoples knew in a general way of this relation, but for centuries the Eastern peoples and the Greeks used it as 3. The Jews used the value as 3, without the added decimal, as indicated in the description of Solomon's Temple in *I Kings,* VII. Hiram, king of Tyre, it is related, made for the Temple a circular basin, called a "molten sea," which was "10 cubits from the one brim to the other"; while a "line of 30 cubits did compass it round about."



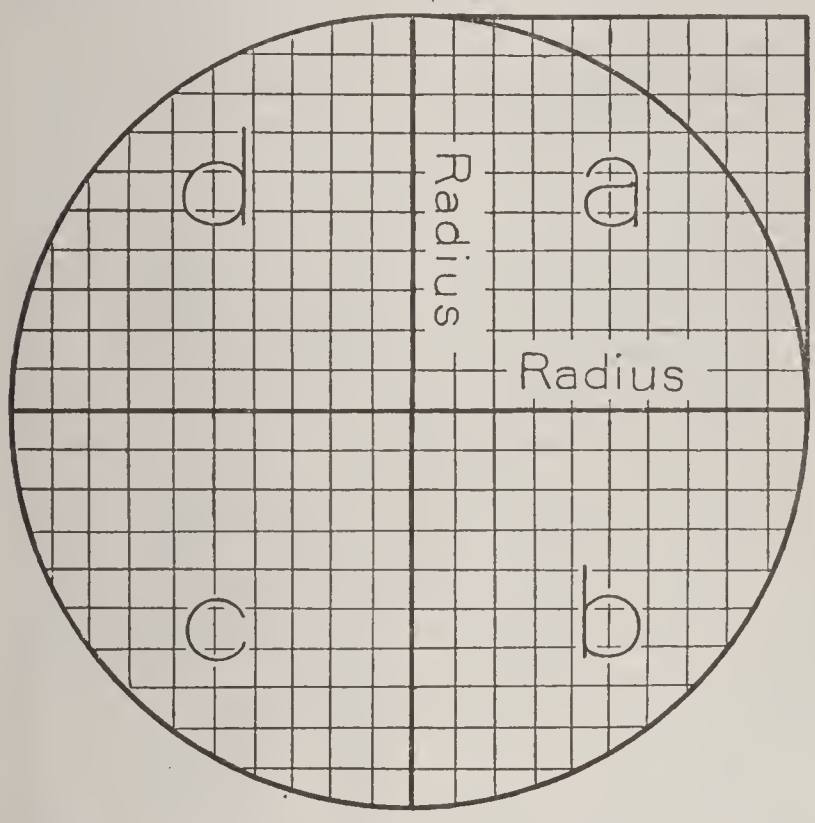
Area of Circle. Draw a circle; draw its horizontal diameter and its vertical diameter; draw a square on the radius, as in the figure shown above.

Compare the area of *a* (which is ¼ of the

circle) with the area of the square in which it is. The eye tells you it is about ¾ of it. Is it more or less than ¾ of it? It is a little more than ¾ of the square. So we see that $a+b+c+d$, or the whole circle, is a little more than $4\times\frac{3}{4}$, or 3 and a fraction, times as great as the square of the radius. With the eye we cannot tell just what this fraction is, but it has been proved that the area of a circle is 3.14159+ times as large as the square built on the radius of the circle. It is put into a short form as follows:

$$\text{Area of a circle} = 3.1416 \times \text{radius}^2$$
or
$$\text{Area of circle} = \pi \times r^2$$
or
$$\text{Area of circle} = \pi r^2$$

This can be seen very clearly by making your drawing on squared paper thus:



Here you may find by actual count of the little squares how many times as large the circle is as the square built on the radius.

Problems. 1. What is the circumference of a cylindrical iron pipe whose diameter is 10 inches?

Solution. Circumference $= 2\pi r$.
Circumference in inches $= 2 \times 3.1416 \times 5 = 31.416$.

2. How many tulip bulbs set 6 inches apart will be required for the outside row of a flower bed 6 feet in radius?

Solution. Circumference $= 2\pi r$.
Circumference in feet $= 2 \times \pi \times 6$.
Number of bulbs $= 2 \times 3.1416 \times 6 \times 2 = 75.3984$.
Practically 75 bulbs.

3. What is the circumference of a stack of hay at the bottom if the radius is 9 feet?

4. What is the circumference of a circular pond 40 feet in diameter?

5. John and Harry set up a circular tent in their yard at the foot of a tree. They erected the center pole at a point six feet from the tree. How many square feet of ground did the tent cover? How many yards around was the space enclosed by the tent? See illustration.

Solution. The distance from the pole to the tree is the radius of a circle.

Area of circle $= \pi \times r^2$.

Number sq. ft. covered $= 3.1416 \times 6^2 = 113.0976$.

The distance around the space enclosed by the tent is the circumference of the circle whose radius is 6 feet.

Circumference $= 2 \times \pi \times r$.

Number of yards around $= \frac{2 \times 3.1416 \times \cancel{6}^{2}}{\cancel{3}} = 12.5664$.

6. Find the cost of clearing a circular skating pond 300 feet in diameter, when the snow is 6 inches deep on the ice and it costs $.10 a cubic yard to clear it away.

7. A cart-wheel, 3 feet in diameter, turns around at the rate of 40 miles an hour; how many revolutions does it make in 1 hour? A.H.

CIRCULA'TION OF THE BLOOD. The arteries, veins and capillaries form a complete system of pipe lines in the body, through which the blood is driven by the central pump —the heart. While all the vessels of this very complete pipe line form one complete system, this is in reality three systems, each having a

special purpose. One system carries the blood through the body, forming the body, or *systemic,* circulation; the second carries the blood through the lungs, forming the lung, or *pulmonary,* circulation; and the third carries the blood through the liver, forming the liver, or *portal,* circulation. The last is properly a part of the systemic circulation.

Each system is double, that is, it consists of two sets of pipe lines—the *arteries,* which carry the blood *from* the heart, and the *veins,* which carry the blood back *to* the heart. In the body and liver circulation the arteries carry red blood, but in the lung circulation they carry dark blood. In all the systems the *capillaries* are the fine, hairlike pipes which connect the arteries and veins.

Wonders of the Circulation. It requires about thirty seconds for a drop of blood to make the rounds from the left ventricle of the heart and back to it, following the route outlined below, and it is estimated that all the blood in the body passes through the heart every two or three minutes. The best authorities estimate that 900 pounds, or 112 gallons, or nearly three barrels of blood pass through each ventricle of the heart in one hour. Since the same amount passes through each, this would make six barrels of blood pumped by the ventricles every hour. The force expended by the heart in one hour would lift 11,250 pounds one foot, or it would raise a man weighing 160 pounds seventy feet. The total work performed by the heart in a day is estimated to be equal to about 7.5 horse power.

Circulation Through the Body. The blood is forced by the contraction of the heart from the left ventricle into the aorta, or great artery, from which main branches lead to the different parts of the body—the trunk, head, arms and legs. Each of these branches divides and subdivides until the arteries become capillaries, which form a complete network all through the body, and through all these branches and capillaries the blood flows, carrying nourishment to the tissues and taking up worn-out and poisonous matter.

As the capillaries are formed by the branching of the arteries at one end, so at the other they unite to form minute veins, which themselves unite into larger veins, until we find large veins side by side with the larger arteries; through these the blood is returned to the heart, where it enters the right auricle through the *vena cava.* See HEART, for illustration of its parts; also color plate herewith.

Circulation Through the Lungs. The blood returned to the heart through the vena cava has given up much of its nutritive material and has taken the worn-out matter and carbon dioxide from the tissues. Moreover, the waste products absorbed by the lymphatics enter the blood in the vena cava so that the stream returned to the heart is full of impurities, which account for its darker color. The circulation through the lungs, which has for its purpose the purification of the blood, begins at the right auricle, from which the blood passes to the right ventricle. By the contraction of the heart, the blood is forced from the right ventricle through the pulmonary arteries to the lungs, where it is distributed by the capillaries to the air cells. Here it gives up carbon dioxide and other impurities and absorbs oxygen. It is then returned through the pulmonary veins to the left auricle, and again begins its journey through the body.

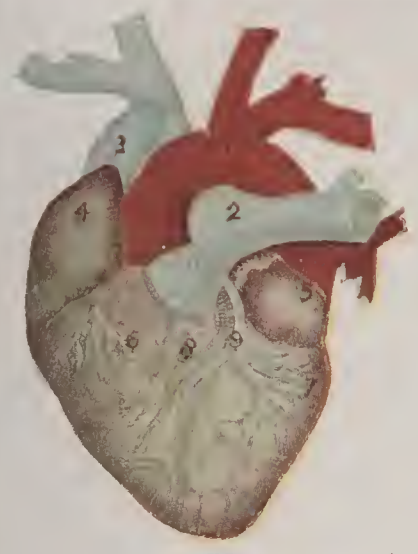
Circulation Through the Liver. The blood from the stomach, spleen, pancreas and intestines is gathered up by a vein called the *portal vein* and carried to the liver. It passes through the capillaries of the liver and is then returned through the hepatic veins to the large veins leading to the heart. During its passage through the liver the bile is secreted from the blood, and other important changes occur, among them the removal of certain poisons that enter the blood from the intestines. W.A.E.

Related Subjects. The reader interested in this subject will find the articles in these volumes on the following topics helpful:

Aorta	Heart
Arteries	Liver
Bile	Lungs
Blood	Lymphatics
Capillaries	Pulse
Harvey, William	Veins

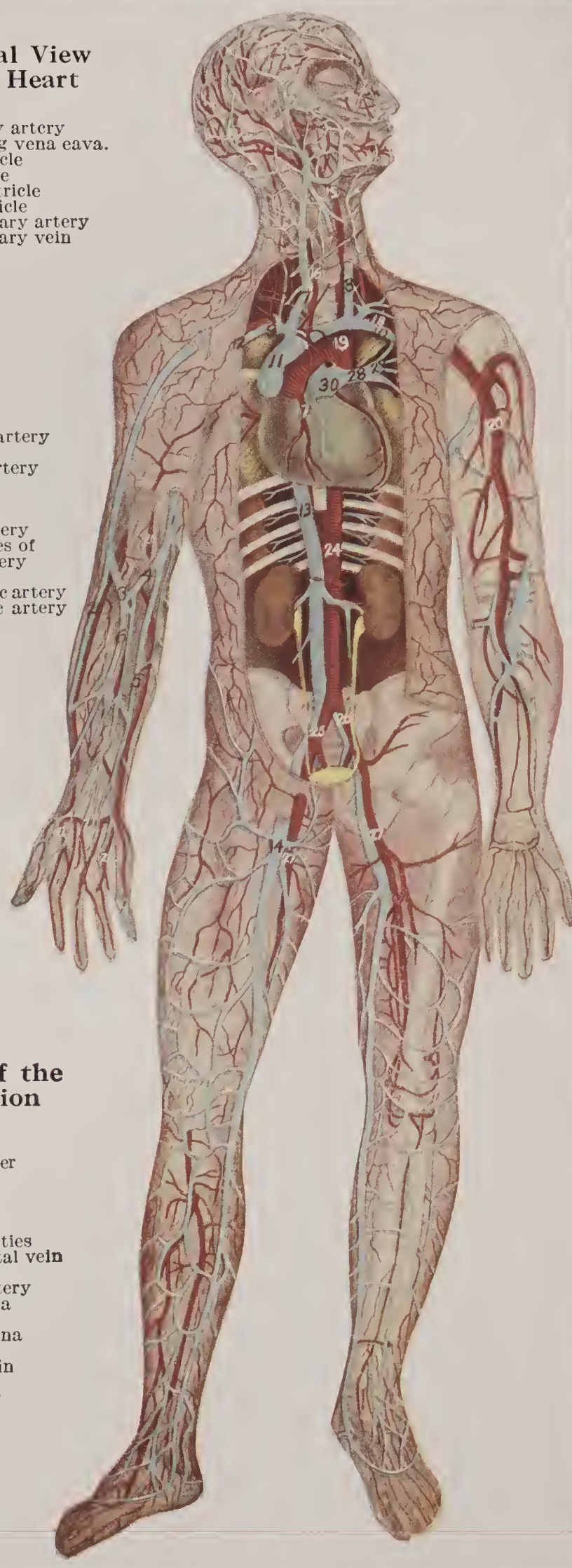
CIRCUS, *sir'kus,* a traveling show of musicians, clowns, acrobats and animals, a form of amusement which has been especially popular since exploited by Phineas T. Barnum (which see). "Circus day" is a never-to-be-forgotten event, especially to the boy or girl in the country. First, the billboards with their amazing pictures advertise the coming wonders; and then, when at last the day comes, early in the morning, before sunrise even, the howling of the animals tells the boy the "circus has come to town." So off he hurries to watch the absorbing task of unloading. Then later in the day he hears the bands playing and sees the parade of gilded wagons, smiling ladies, the clowns and the animals. And later he

CIRCULATION OF THE BLOOD



External View of the Heart

1. Aorta
2. Pulmonary artery
3. Descending vena eava.
4. Right auricle
5. Left auricle
6. Right ventricle
7. Left ventricle
8. Left coronary artery
9. Left eoronary vein



Veins and Arteries

1. Basilie vein
2. Superficial radial vein
3. Median cephalic vein
4. Median basilic vein
5. Anterior superficial ulnar vein
6. Superficial median vein
7. Right internal jugular vein
8. Left internal jugular vein
9. Right innominate vein
10. Left subclavian vein
11. Vena cava superior vein
12. Right subclavian vein
13. Ascending vena cava vein
14. Common femoral vein
15. External carotid artery
16. Common carotid artery
17. Coronary artery
18. Left subclavian artery
19. Arch of aorta
20. Brachial artery
21. Deep palmar arch
22. Palmar digital artery
23. Collateral branches of palmar digital artery
24. Aorta
25. Right common iliac artery
26. Left common iliac artery
27. Femoral artery
28. Pulmonary vein
29. Left pulmonary vein
30. Right pulmonary vein

Scheme of the Circulation

1. Heart
2. Lung
3. Head and upper extremities
4. Spleen
5. Intestine
6. Kidneys
7. Lower extremities
8. Liver and portal vein
9. Aorta
10. Pulmonary artery
11. Ascending vena cava
12. Deseending vena cava
13. Pulmonary vein
14. Portal vein
15. Carotid artery
16. Lacteals
17. Thoracie duct

OUTLINE AND QUESTIONS ON CIRCULATION

Outline

I. The Blood

(1) Composition
  (a) Corpuscles
  (b) Serum or plasma
(2) Amount
(3) Temperature
(4) Coagulation
(5) Functions

II. Organs of Circulation

(1) The heart
  (a) Shape
  (b) Size
  (c) Position
  (d) Structure
    1. Auricles
    2. Ventricles
    3. Valves
    4. Membranes
    5. Function
(2) Arteries
  (a) Structure
  (b) Distribution
  (c) Circulation in arteries
  (d) Kind of blood carried
(3) Veins
  (a) Structure
  (b) Distribution
  (c) Circulation in veins
  (d) Kind of blood carried
(4) Capillaries
  (a) Definition
  (b) Close connection with arteries and veins
  (c) Function

III. Circulatory Systems

(1) Systemic or body circulation
  (a) From the left ventricle
  (b) Through the body
  (c) Returned to right auricle
(2) Pulmonary or lung circulation
  (a) From the right ventricle
  (b) Through the lungs
  (c) To the left auricle
(3) Portal or liver circulation
  (a) Portal vein
  (b) Hepafic veins

IV. Functions of Circulation

(1) Nourishment
(2) Purification
(3) Elimination of waste
(4) Heat
(5) Part of work accomplished by each system
  (a) Heart
  (b) Arteries and veins
  (c) Capillaries
  (d) Lungs
  (e) Liver

Questions

How many barrels of blood does your heart pump between nine o'clock and three?

Into what part of the heart does the blood flow through the *vena cava?*

What is the difference in structure between veins and arteries? What is the difference in what they carry?

What is the blood doing as it flows through the arteries? What change is taking place in its appearance?

Why must the blood flow to the liver? How would the digestive processes suffer if the liver were unable to perform its work on the blood?

Name the three circulatory systems, and tell briefly the work of each.

How much do you weigh? How far would the force exerted by your heart in one hour lift you?

What do the lungs supply to the blood? What do they take from it?

How did Dr. William Harvey discover the principles of blood-circulation?

How long does it take a drop of blood to make its circuit from the left ventricle, through the various systems, and back to its starting point?

How many times in twenty-four hours does all the blood in your body pass through your heart?

goes to the big white tent which seems to have grown in the meadow over night. With eyes wide open and shining, he sees the daring deeds of the acrobats and bareback riders, or he laughs with glee at the amusing antics of the clowns.

The circus to-day is not merely for children. Largely through the work of Barnum, it has developed into an exhibition of the best talent in this particular form of entertainment, and the older people enjoy it, too. The modern circus formerly had but one ring with only about six performers, but it now has at least two rings, sometimes three, and employs as many as 3,000 people, including workmen. It traveled in early days by teams, but now owns its own railroad trains, excepting engines.

The Roman Circus. The circus originated among the Romans and consisted first of merely horse and chariot races; the name means *ring* or *circle,* from the circuit made by the racers. Later wrestling, athletic contests of all kinds and other games were added, and large sums of money were spent to bring wild animals from different parts of the country to be killed in the arena, or center of the circus.

A nearly oblong building without a roof formed the circus of Roman times. The seats were ranged on two sides in tiers like the modern ball parks and theaters; many were of marble, and all were built not to be removed, as are the hippodromes of to-day. On the outside the circus was surrounded with colonnades, galleries, shops and public places, like the side shows and refreshment booths of the circus of to-day.

There were eight or ten circuses at Rome, the largest of which was the *Circus Maximus,* 1,875 feet long and 625 feet wide, capable of seating 260,000 spectators. The circus of Caracalla, however, is in the best state of preservation. A tourist visiting the ruins of these wonderful one-time places of amusement, pictures in his mind's eye a "circus day" of long ago. He hears the trumpet call, the starting signal; then he sees the heavy, magnificent chariots whirl past, the strong charioteers, with reins looped about their waists, risking their lives to amuse the throng of people of every class—the workmen, the nobility and the Imperial household. Or he imagines the roar of the lions and sees the gladiator step into the arena to match strength and cunning with a lion thirsting for blood. Possibly he thinks of the gymnastic contests and races between the finest specimens of manhood in the land. For such were the circuses of the days of Pompey, Caesar and Augustus. M.S.

AS THE CIRCUS MAXIMUS APPEARED

CIRRHOSIS, *si·ro'sis,* a diseased condition of tissues, occurring in certain organs of the body. Though found most frequently in the kidneys and liver, it may affect the lungs, spleen, ovaries, heart and stomach. *Cirrhosis of the kidney* is a chronic inflammation of the connective-tissue elements of that organ, causing one form of Bright's disease (which see). *Cirrhosis of the liver* consists in an abnormal growth of the connective-tissue elements of the liver. The organ itself at first becomes greatly enlarged, but later contracts until it is below normal size. The new growth of connective tissue causes *atrophy,* or wasting, of the liver cells, and it often is responsible for the stopping of the bile current. These disturbances may result in the dilating of the veins and in dropsy. See LIVER; DROPSY.

CITIES OF REFUGE, in the story of the children of Israel, six out of forty-eight cities given to the tribe of Levi, in the division of Canaan, which were set apart as places of refuge for the "slayer that killed any person unawares and unwittingly" (see *Joshua,* XX). Whoever fled to one of these cities was protected temporarily from any avenger who might pursue him, and was permitted to plead his cause in the hall of judgment. If found not guilty of wilful murder he could live in the city until the death of the high priest, when he was at liberty to return to his home. If adjudged guilty, however, he was returned for punishment to the place from which he had fled. These cities were Kedesh, Shechem and Hebron, on the west side of the Jordan; and Bezer, Ramoth-Gilead and Golan, on the east.

The temples and altars of the gods were sacred places of refuge for the ancient Greeks and Romans, and for a long period the Christian churches had a similar purpose. See ASYLUM; BLOOD, AVENGER OF.

CIT'IZEN, in the broadest sense, a member of a political state, which, in return for alle-

giance, guarantees its protection to person and property and insures the enjoyment of certain rights and privileges. The term is derived from the Latin *civis,* meaning *citizen,* from which comes also the word *city.* To the ancient Greeks and Romans, however, *citizen* did not signify a resident of a town, but a member of a free, self-governing commonwealth, and it is used in the same sense to-day in the American, the Swiss and the French republics. In modern monarchical nations, as Great Britain and Germany, the relation of citizenship to the government is usually expressed by the term *subject,* and *citizen* is applied there to a local resident.

In theory, a government not only guarantees its citizens security at home, but extends its protection to them while they are absent in foreign lands. The security which an alien enjoys in a foreign country indicates the strength of his home government and the prestige in which it is held by the other nations of the world. This idea finds its counterpart in the plea of Paul, the missionary, who, when brought by the Jews before Claudius Lysias, the chief captain of the Romans stationed at Jerusalem, was saved from death because he reminded his captors that he was a Roman citizen (see *Acts* XXII, XXIII).

A Citizen of the United States. According to the Constitution, "All persons born or naturalized in the United States, and subjects thereof, are citizens of the United States, and of the state wherein they reside." Women and boys and girls are citizens as well as men, and Indians who have adopted the dress and customs of civilization and have abandoned tribal relations are admitted to citizenship. This privilege, however, is denied Chinese, Japanese, Burmese, Porto Ricans and Hawaiians.

Citizenship and the right to vote are not identical, for suffrage is a privilege conferred by the individual states, not by the Federal government. Women in eleven states west of the Mississippi River are voting citizens and may cast their ballot for all elective officers, including Presidential electors. Those in Illinois may vote for nominees to all offices not created by the state constitution, including Presidential electors, and in nearly half the states women may vote for school officials. A foreigner who makes his home in any state is an alien until he is naturalized (see NATURALIZATION), but in some states the filing of a declaration of intention to become naturalized gives the individual the rights of citizenship. See WOMAN SUFFRAGE.

A Citizen of Canada. Persons born in the Dominion are Canadian *citizens* and British *subjects,* and citizenship is likewise granted to a person born out of the realm whose father is a British subject either by birth or naturalization. A person naturalized in Canada is a British subject in every other portion of the British Empire, and vice versa. Before naturalization can be granted in Canada the applicant must have resided in Canada for not less than one year immediately preceding the application, and must have resided either in Canada or in some other part of the king's dominions for a period of four years within the eight years before the application. Each of the provinces regulates by law the granting of the right to vote. B.M.W.

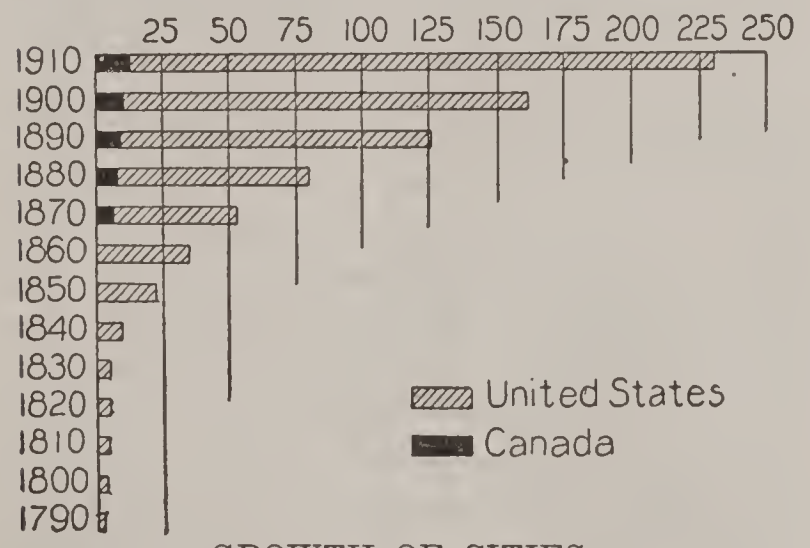
CITRIC, *sit'rik,* **ACID,** an acid found in many common fruits, such as gooseberries and red currants, and especially abundant in the citrus fruits—lemons, oranges and limes—from which it takes its name. It is generally prepared for commercial use from lemon juice. It can also be made from glucose (which is made from corn starch) by a special kind of fermentation. When pure it is white and odorless, with a pleasant, sour taste. In combination with metals it forms crystalline salts, known as *citrates,* which are used in medicine as cooling drinks. Effervescent citrates of magnesium, used as easily-taken and pleasing laxatives, are mixtures which when dissolved in water produce magnesium citrate by chemical action. Carbonic-acid gas is formed as another product of such action, and it is the escaping bubbles of this gas which cause the effervescence, or "fizzing." Sometimes the term is applied erroneously to other effervescent, laxative medicines. Crude citric acid is used to prevent the formation of colors not wanted in calico printing, and as a substitute for lemon juice in making beverages. J.F.S.

CIT'RON, a large, sour, lemonlike fruit, valued chiefly for its thick, tender rind. When preserved it is used in cakes and candies; when fresh it yields two perfume oils. The juice of the fruit is sometimes used with sugar, for a drink like lemonade, or to flavor various liquors. The citron tree, a native of India, has been a favorite in Europe since the days of the ancient Greeks, because of its handsome fruit and violet-colored blossom. It is cultivated in California and Southern Florida to a small extent, but cannot thrive well on account of frosts. In the United States the name is also given to a small, hard watermelon

that is used for pickles and preserves, and is used by California fruit growers to include lemons, oranges and the like.

CIT'RUS, a commercially important genus of fruit-bearing trees and shrubs, mostly spiny or thorny, including the orange, citron, lemon, lime, grapefruit, bergamot and others, all of which are described in these volumes under their common names. Citrus trees are natives of India and other warm parts of Asia, but most of them are now cultivated in other parts of the world, especially for their fruit. Citrus plants have rather long, pointed leaves or leaflets, united by a distinct joint to the leaflike stalk. They all bear pulpy fruits, with spongy rinds, and are valued as dessert, for preserves or for cooling drinks. The leaves, the rind of the fruit and the flowers all contain valuable volatile (easily evaporated) oils.

CITY, a unit of local government, distinguished from a town or village usually by greater population and by greater powers of



GROWTH OF CITIES

The number of cities in the United States and Canada having each over 25,000 population in the years named. The dates given, however, are for the United States; the Canadian census is always one year later.

local self-government. If a child is called on to define a city he will probably say that it consists of a lot of people living close to each other, whereas in the country people live farther apart, for the child does not, of himself, realize that it is the difference in *government* that makes the real distinction.

The Development of a City. Occasionally a city springs into existence almost full grown. Thus Gary, Ind., had few of the transition stages which mark the growth of most cities; its founders knew that it was to become a busy manufacturing town, and they made their plans to that end from the beginning. But in most cases the process is more gradual, and something like this takes place:

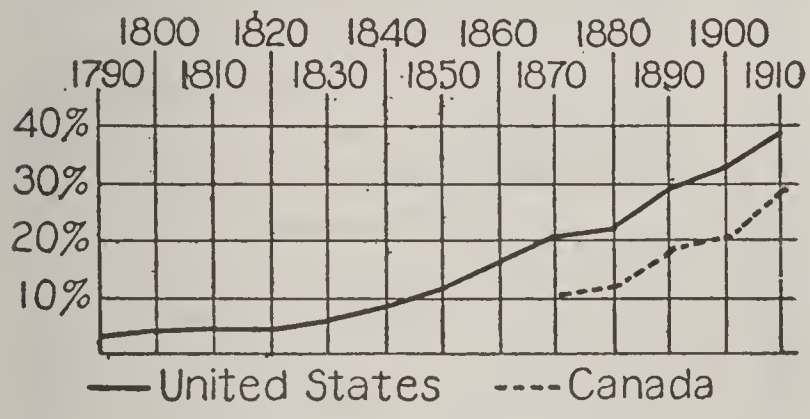
In any district certain roads are bound to be more traveled than others. In time some enterprising blacksmith sets up a shop at the point where two of these busy roads cross, and his success is so evident that a general storekeeper soon follows his example. Then perhaps a doctor chooses that location for his office and home, or a carpenter settles there. Slowly the little community grows, each new business or residence attracting others, but still the people are a part of the township, with no special needs and no special public expenses.

Finally the settlement is large enough to feel the need of a school. Better roads and sidewalks are necessities if there is to be any social life, and there must also be street lights, and some better way of obtaining water than from wells. When the inhabitants of the little community bring such matters before the township authorities they meet with instant rebuff: why should the people living miles from this corner settlement let themselves be taxed to confer benefits on these favored few? In other words, if the settlement wants these improvements it must pay for them. Under the laws of most states and provinces such a community may be incorporated as a village. Then it may elect its own officers, raise its own funds and establish its own laws, provided it does not overstep those of any higher authority. From this time on the change is one of degree only—the village becomes a city and must have a new charter, but its purposes and methods are those of the old village on a larger scale.

The number of people who may incorporate as a city varies in each state and province, but the minimum is usually 1,000, though sometimes it is as high as 5,000. Villages containing the required number of inhabitants usually make the change because larger powers are granted by the state or province to borrow money for pavements, sewers, street lighting and other public works, and also because the usual division of a city into wards is thought to give all portions of a community a fair share in the government. A third reason is that every community is eager to proclaim its growth. A village ordinarily becomes a city by adopting a city *charter* (which see). In most states and provinces the legislature has passed an act stating uniform requirements for the incorporation of cities, but in a few it must consider separately each application for a charter. It is noteworthy that the city or ward system is not favored by all, as is shown

by the fact that Brookline, Mass., for example, though it has 33,000 people, is still a village. On the other hand, Harrison, Mich., with 543 people in 1910, is a city with three wards.

Officers. Under the usual form of city government the chief executive officer is the mayor. Other officers are a city clerk, treasurer and assessor, all elected. The city council, which is the legislative body, is usually com-



FROM FARM TO CITY

The above chart shows the percentage of people living in communities of 8,000 inhabitants or over. Canada is following the United States in changing from a nation of farmers to one of city dwellers.

posed of a single chamber, consisting of two aldermen from each of the wards into which the city is divided. With the approval of the council the mayor appoints the heads of various executive departments, including the chief of police, the fire marshal, the superintendent of public works and the board of education. A system of city courts is operated by elected judges. Since the beginning of the twentieth century several types of city government have been developed which somewhat resemble village government. Among these are the *city manager plan* and the *commission form of government,* both of which are described in these volumes.

The accompanying outline considers the city in all its phases—its geography, its government and its history. It may be necessary to make occasional changes to meet local conditions, but in the main it will answer all needs.

Fifty Largest Cities of the World. Even in ancient times very large cities were numerous. Thebes, Memphis, Babylon, Nineveh, Carthage, Athens, Rome—all were great cities as well as empires. Bagdad, Damascus and Cairo were flourishing cities in the Middle Ages, and by 1500 there were in Europe at least half a dozen cities with a population of over 100,000. Then as now there was a tendency for people to congregate in the capitals. In the following table of the largest cities in the world to-day, twenty-seven, or two more than one-half, are state, provincial or national capitals.

FIFTY LARGEST CITIES OF THE WORLD

Latest Official Figures or Estimates

1. London, 7,252,963
2. New York, 5,621,151
3. Paris, 2,888,110
4. Chicago, 2,701,212
5. Berlin, 2,071,257
6. Tokio, 2,033,321
7. Vienna, 2,031,498
8. Petrograd, 2,019,000
9. Philadelphia, 1,823,-158
10. Moscow, 1,618,000
11. Buenos Aires, 1,-560,163
12. Constantinople, 1,-300,000
13. Warsaw, 1,250,000
14. Osaka, 1,226,590
15. Calcutta, 1,222,313
16. Rio de Janeiro, 1,-128,637
17. Detroit, 993,739
18. Bombay, 979,445
19. Canton, 900,000
20. Budapest, 880,371
21. Hankow, 826,000
22. Tien-tsin, 800,000
23. Cleveland, 796,836
24 Glasgow, 784,496
25. Saint Louis, 772,897
26. Boston, 747,923
27. Liverpool, 746,421
28. Baltimore, 733,826
29. Sydney, 725,400
30. Manchester, 714,333
31. Naples, 691,982
32. Peking, 690,000
33. Brussels, 663,647
34. Cairo, Egypt, 654,-476
35. Shanghai, 651,000
36. Melbourne, 651,000
37. Milan, 645,366
38. Bangkok, 628,675
39. Fu-chow, 624,000.
40. Odessa, 620,155
41. Madrid, 599,807
42. Chung-king, 598,000
43. Munich, 596,467
44. Amsterdam, 595,258
45. Hang-chow, 594,000
46. Algiers, 590,000
47. Leipzig, 589,850
48. Pittsburgh, 588,193
49. Barcelona, 587,411
50. Rome, 576,435

Fifty Largest Cities in the United States. In the United States, contrary to the general rule in Europe and other parts of the world, the largest cities are rarely capitals. In Europe the cities often became largest because they were capitals. In the United States, on the other hand, the state capitals are usually centrally located in the state, whereas the location of the largest cities is determined by advantages of position with regard to commerce and industry. In the following table one city, Washington, D. C., is the national capital and nine are state capitals.

FIFTY LARGEST CITIES IN THE UNITED STATES

From Fourteenth Census, 1920

1. New York, 5,621,151
2. Chicago, 2,701,705
3. Philadelphia, 1,823,-158
4. Detroit, 993,739
5. Cleveland, 796,836
6. Saint Louis, 772,897
7. Boston, 747,923
8. Baltimore, 733,826
9. Pittsburgh, 588,193
10. Los Angeles, 575,480
11. San Francisco, 508,-410
12. Buffalo, 505,875
13. Milwaukee, 457,147
14. Washington, 437,571
15. Newark, 414,216
16. Cincinnati, 401,158
17. New Orleans, 387,-219
18. Minneapolis, 380,498
19. Kansas City, 324,410
20. Seattle, 315,652
21. Indianapolis, 314,-194
22. Jersey City, 297,864
23. Rochester, 295,850
24. Portland, Ore., 258.-288
25. Denver, 256,369
26. Toledo, 243,109
27. Providence, 237,595
28. Columbus, 237,031
29. Louisville, 234,891
30. Saint Paul, 234,595
31. Oakland, 216,361
32. Atlanta, 200,616

33. Omaha, 191,601
34. Worcester, 179,741
35. Birmingham, 178,270
36. Richmond, ...
37. Syracuse, 171,647
38. New Haven, 162,390
39. Memphis, 162,351
40. San Antonio, 161,308
41. Dallas, 158,976
42. Dayton, 153,830
43. Bridgeport, 143,152
44. Scranton, 137,783
45. Grand Rapids, 137,634
46. Paterson, 135,866
47. New Bedford, 121,217
48. Fall River, 120,485
49. Nashville, 118,342
50. Spokane, 104,204

The above figures are from the fourteenth census of the United States; the enumeration was made in January, 1920. The relative positions of many cities changed in the decade; for example, Detroit rose from ninth place to fourth.

The Largest Cities in Canada. The figures given in the following table of the largest Canadian cities and towns are from the Dominion census of 1921. There are sixty-two cities or towns each with over 8,000 inhabitants. It is interesting to note that eight of the first fourteen cities are capitals, and that Fredericton, N. B., is the only one of the nine provincial capitals which does not appear in the complete list. It is also a striking fact that the total population of these fifty Canadian cities does not equal that of the second city in the United States.

1. Montreal, 618,506
2. Toronto, 521,893
3. Winnipeg, 179,087
4. Vancouver, 117,217
5. Hamilton, 114,151
6. Ottawa, 107,843
7. Quebec, 95,193
8. Calgary, 63,305
9. London, 60,959
10. Edmonton, 58,821
11. Halifax, 58,372
12. Saint John, 47,166
13. Victoria, 38,727
14. Windsor, 38,591
15. Regina, 34,432
16. Brantford, 29,440
17. Nanaimo, 29,088
18. Saskatoon, 25,739
19. Verdun, 25,001
20. Hull, 24,117
21. Sherbrooke, 23,515
22. Sydney, 22,545
23. Three Rivers, 22,367
24. Kitchener, 21,763
25. Kingston, 21,753
26. Sault Sainte Marie, 21,092
27. Fort William, 20,541
28. Maisonneuve, 19,886
29. Saint Catharines, 19,881
30. Peterborough, 19,477
31. Moose Jaw, 19,285
32. Guelph, 18,128
33. Westmount, 17,593
34. Moncton, 17,488
35. Glace Bay, 17,007
36. Stratford, 16,094
37. Saint Thomas, 16,026
38. Lachine, 15,404
39. Brandon, 15,397
40. Port Arthur, 14,886
41. Sarnia, 14,877
42. New Westminster, 14,495
43. Chatham, 13,250
44. Galt, 13,216
45. Saint Boniface, 12,821
46. Charlottetown, 12,329
47. Belleville, 12,206
48. Owen Sound, 12,190
49. Oshawa, 11,940
50. Lethbridge, 11,097
51. Saint Hyacinthe, 10,859
52. North Bay, 10,692
53. Shawinigan Falls, 10,625
54. Levis, 10,470
55. Brockville, 10,040
56. Woodstock, 9,935
57. Medicine Hat, 9,634
58. Valleyfield, 9,215
59. Joliette, 9,113
60. Orillia, 8,744
61. Sudbury, 8,621
62. Welland, 8,654

Consult Arthur's *Our Home City;* Munro's

Outline for a City

I. Map of City, Showing Principal Streets, Location of Principal Buildings, Waterways, etc.

II. Description

(1) Area and population
(2) Location
  (a) In township
  (b) In county
  (c) In state
  (d) Directions from other cities
(3) Surroundings
  (a) Suburbs
  (b) Beauty spots

III. Government

(1) Chief executive
  (a) Title
  (b) How chosen
  (c) Length of term
  (d) Duties
(2) Other elective officers
  (a) Financial
    1. Treasurer
    2. Assessor
    3. Collector of taxes
  (b) Clerk
  (c) Fire
  (d) Police
  (e) Judicial
(3) Appointive officers
  (a) Health
  (b) Education
  (c) Parks
  (d) Streets
  (e) Water supply

IV. Education

(1) Board of education
(2) Superintendent of schools
(3) Public schools and buildings
(4) Private institutions
  (a) Kinds
  (b) Endowments

V. Public Utilities

(1) Rail and water communication
(2) Street railways
(3) Water supply
(4) Lighting system; how owned
  (a) Electric light
  (b) Gas

VI. Parks and Boulevards

(1) Parks
  (a) Number
  (b) Area
  (c) How controlled
  (d) How supported
(2) Boulevards
  (a) Extent
  (b) Special rules governing

VII. Commerce and Industry

(1) Banking strength
(2) Manufactured articles
  (a) Kinds
  (b) Market
  (c) Annual value
  (d) Persons employed in manufactures
  (e) Wages paid annually

VIII. Study of Charter

IX. History

(1) When settled
(2) Date of organization as a village
(3) Date of change to city government
(4) Notable events
(5) Persons more than locally known

The Government of American Cities; also the articles in these volumes on CITY MANAGER; CITY PLANNING. E.D.F.

CITY MANAGER, an official employed by the governing body of a city to manage its business affairs. This is a recent modification of the commission plan of government (which see). Under the city-manager plan, there is a small elective commission, but this body does not itself exercise legislative or administrative powers. Instead, the commission appoints, and discharges at its pleasure, a city manager. This officer is held responsible for the management of the city's business, which he is expected to conduct as he would a private enterprise, aiming to secure the best results with the least expenditure of public funds and the highest degree of efficiency. In most cases he has authority to employ and discharge helpers and minor officials. The city-manager plan of administration is found to be of great value in villages and small cities, since it removes public service from politics, and frees the municipality from the evils attending the system of filling offices to pay political debts. Up to 1922 about 200 American cities had adopted the city-manager plan, the largest of which was Akron, O. Several American universities are considering the advisability of introducing courses for training men to become city managers. See CIVIL SERVICE, subhead *State and City Civil Service.*

Consult Clay's *City Building.*

CITY PLANNING. The purpose of city planning is to provide for the business interests, the residences, the places of recreation and the means of transportation of a city, and to do this in such a manner as will make the city convenient, sanitary and beautiful. Most cities have grown from small villages by successive additions and have not followed any plan of development which takes all interests into consideration. While it is not practicable to remedy much that has been done, many large cities now have city-planning commissions which have oversight of new works and can prevent a repetition of mistakes of the past. In France, Germany and England city planning has received attention for many years.

A complete plan for the city of Washington was made by the French architect L'Enfant, but it has not been strictly followed until recently. The national commission appointed to take charge of the beautifying of that city was headed by Daniel Hudson Burnham (which see), who collaborated with McKim, Olmsted and Saint Gaudens. Canberra, the new capital of the commonwealth of Australia, is being built after a complete plan furnished by Walter B. Griffin.

Consult Senate Document 442, *National Conference on City Planning,* which may be obtained from the Government Printing Office, Washington, D. C.; also, Bruere's *The New City Government.*

CITY STATES, those states in which the political, intellectual and religious life of the people is centered in a single city, which has all the powers of a self-governing nation, and exercises political authority over such territories as it may control. The city state had its fullest development in ancient times, the most conspicuous examples being Athens and Rome. The Athenian state consisted of Athens proper, and also the various outlying villages of the Attic territory; the free inhabitants of this territory owed allegiance not to Attica but to the city of Athens, and were, properly speaking, Athenian citizens. The ancient city state was, in territory, identical with a modern city; in political rights, it was identical with a modern nation.

In the Middle Ages the Italian cities of Milan, Florence, Genoa, Venice and Naples rose to power as independent states; the free cities of Germany, Hamburg, Bremen and Lübeck, and some of the cantons of Switzerland are present-day examples of the city state in a modified form.

CIVET, *siv'et,* a beautiful and valuable animal of the warmest regions of the Old World, chiefly Africa and the Malayan Islands. About two or three feet long and ten inches high, it is more slender than a raccoon, and has a long

THE CIVET

tail. The fur, gray above and white below, is tinged with yellow and marked by dusky spots in rows. Civets live in holes, like foxes, and eat birds and other small animals. They are also fond of crocodile eggs, and are considered valuable along the Nile because they prevent

the too rapid increase of the crocodile family. Most of all, however, civets are valued for a fatty substance with a musky odor, which is taken from pouches in their bodies connected with the genital organs, and used for making perfumes. Only a few drops are taken each week from one animal. In London an ounce of pure civet is valued at $10, and many thousand ounces are imported each year.

The American civet-cat, although so called, is not a true civet.

CIVIC, *siv'ik,* **FEDERATION,** National, an organization of prominent employers, labor leaders and public men, formed in 1901 for the purpose of settling and preventing labor disputes and strikes. The organization grew rapidly and now includes nine departments, the most important of which is probably that for preventing and settling strikes; others wherein good work has been done are the welfare department, the woman's department, the social insurance department and the department for preventing accidents to employees and securing compensation for those who are injured. Each department is in charge of an executive committee comprising members representing the public, the employees and the employer. Headquarters are maintained in New York City.

CIVIL DEATH, *siv'il deth.* According to law a person may be alive and enjoying good health and still under certain conditions be dead to all his civil rights. In some states, as New York, this is true of one sentenced to the state prison for life; all his civil rights are taken from him and to the world he is as dead. In all states absence for a specified time without any knowledge of the whereabouts of the individual renders him legally dead to his civil rights; this period in most states is seven years. Supposing A, living in Wisconsin, should leave his home and family and go to Alaska. If at the end of seven years no word has been received from him, the law assumes him to be dead; his estate can be settled by probate, provided the family consents, and his wife may legally marry again. Should he afterwards return he could not compel the court to restore his estate or family; these are legally forfeited, beyond all redress.

CIVIL GOVERNMENT, in the widest sense, is the administration of the public affairs of a country, a state, or a smaller political unit. Civil government indicates "a state of society reduced to order and regular government," as distinguished from a barbarous or savage state. The simplest definition of the term is *citizen government,* for *civil* is from *civis,* meaning *citizen.*

Principles of Civil Government. Although there is great variety in the principles and methods of government in different countries, there is a general similarity in the organization of the central or national government. The great departments of the government—state, or foreign affairs; treasury, or finance; postoffice, etc.—are under the direction of Cabinet members who are either the chief advisors of the executive, as in the United States, or are themselves the real executives, as in Canada and Great Britain. In any case, however, these chiefs are political and temporary officers, and the permanent officials, including assistant or under secretaries, are largely responsible for the routine of government organization.

In local and internal affairs the government organizations are as varied as the political ideals of the nations. It is generally true that in those countries in which feudalism left its strongest marks the government is most highly centralized, whereas in countries which have partly emancipated themselves from feudal tradition, decentralization is noticeable. No modern civilized state, however, is either wholly centralized or wholly decentralized. Centralized government, according to the popular view, is most advantageous when it deals with national affairs. Decentralized control of the army, or for international relations, for ex-

ample, would be disastrous. It would seem absurd to-day if each of the states of the American Union had independent relations with Great Britain, or with France or Germany. On the other hand, decentralization is helpful in dealing with local affairs. It makes the government quickly responsive to public opinion, whereas a centralized government tends to disregard criticism and to become mechanical in its attention to details.

Civics, the Study of Civil Government. The study of civil government, or of civics, as it is now generally called, is one of the modern branches of school instruction. As early as 1869 an attempt was made to introduce the subject in American schools, but at that time it was thought that a knowledge of the framework of government, as outlined in the Constitution, was the only thing needed. To-day the study of civics includes not merely the machinery of government, but an investigation of its actual workings, particularly as they affect the individual citizen. The duties of a citizen towards the government are as much a part of civics as the duties of the government towards the individual. Civics is still taught to a considerable extent in connection with history, but in addition to its historical side teachers now emphasize the practical, present-day value of this subject. The fundamental purpose, after all, is to make better citizens—a result which can be hastened by teaching children both the theory and the operation of government.

Related Subjects. The numerous articles on civil government which these volumes contain are here listed. For ease of reference they are classified.

EXECUTIVE

Agriculture, subtitle *Department of*
Ambassador
Assessor
Attaché
Bureau
Cabinet
Census
Chargé d'Affaires
Civil Service
Commerce, Department of
Consul
Crown
Czar
Dauphin
Dead-letter Office
Dictator
Diplomacy
Divine Right of Kings
Doge
Education, subtitle *Bureau of*
Electoral College
Emperor
Exchequer, Chancellor of the
Executive
Fish Culture
Governor
Governor-General
Imperator
Interior, Department of the
Kaiser
Khan
Khedive
King
Labor, Department of
Legate
Lieutenant-Governor
Majesty
Mikado
Ministers, Foreign
Mint
Navy, Department of the
Pardon
Pasha
Postoffice Department
Premier
President of the United States
Prince
Privy Council
Queen
Rajah
Regent
Royal Northwest Mounted Police
Sanitary Commission
Secret Service
Sheik
Stadtholder
State, Department of
Sultan
Supremacy, Royal
Theocracy
Treasury
Veto
Vice-President
War, Department of
Weather Bureau

LEGISLATIVE

Amendment
Assembly
Burgesses, House of
Civil Law
Committee of the Whole
Common Council
Congressional Record
Congress of the United States
Delegate
Diet
Duma
Equity
Initiative and Referendum
Junta
Legislature
Lobby and Lobbying
Local Option
Parliament
Pure Food Laws
Reichstag
Senate
Senate of the United States
Short Ballot
Speaker
Statute
Zemstvo

JUDICIAL

Admiralty
Attorney-General
Chancellor
Claims, Court of
Courts
Judge
Justice, Department of
Justice of the Peace
Juvenile Court
Morals Court
Probate
Supreme Court

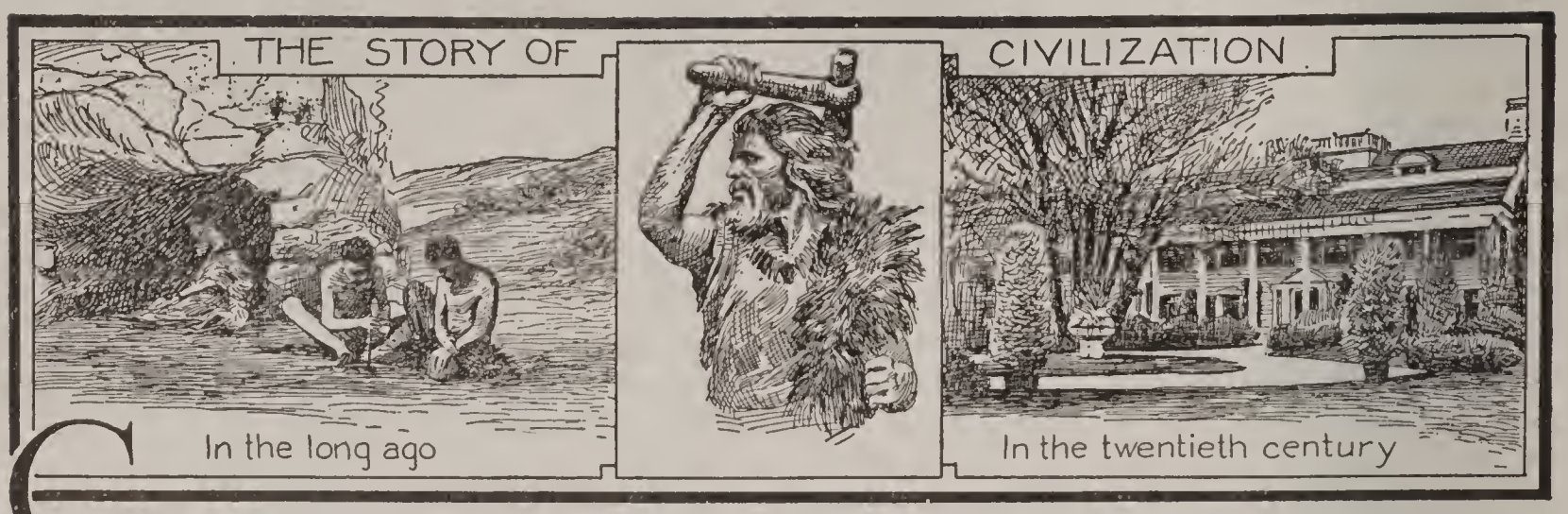
LOCAL

Alderman
Burgomaster
Canton
City Manager
City Planning
Commission Form of Government
Commune
Constable
Coroner
County
Fire Department
Fire Prevention
Garbage
Mayor
Municipal Government
Municipal Ownership
Police
Poll Tax
Selectmen
Sheriff
Town Meeting

GENERAL

Alien
Annexation
Australian Ballot
Autonomy
Ballot
Caucus
Citizen
Civil List
Conservation
Constitution
Constitution of the United States
Customs Duties
Election
Electoral Commission
Empire
Exterritoriality
Flag
Forests and Forestry
Franking Privilege
Free Trade
Government
Imperialism
Income Tax
Inheritance and Inheritance Tax
Internal Revenue
Lands, Public
Law
National Debt
Naturalization
Oligarchy

Passport
Primary Election
Privy Seal
Province
Recall, The
Registration
Republic
Repudiation
Revenue Cutter
Seal
Single Tax
Sovereignty
Squatter Sovereignty
Stamp
State
Subsidy
Suffrage
Tariff
Tax
Territory
Toll
Treaty
Voting Machine
Woman Suffrage



CIVILIZATION, *siv il i za' shun.* The development of civilization is one of the most interesting of the world's stories. It is one in which everybody has a part, and the sooner each one learns to play his part well the sooner each will enjoy the fruits of a perfect civilization. The story is a long one. It has been in the making upwards of 100,000 years, yet Emerson tells us that we are only "in the cock-crowing and the morning-star." It is divided into three parts, *savagery, barbarism* and *civilization,* and each of these parts is likewise in three parts, known as *lower, middle* and *higher* savagery, barbarism and civilization.

The best thinkers and the best workers of savagery paved the way to barbarism; and the best thinkers and the best workers of barbarism paved the way to civilization. And if we are to have a better civilization, we must have boys and girls and men and women who are willing and able to be good thinkers and good workers.

Lower Savagery. Man in lower savagery was not aware of doing anything for people who were to live after him. In fact, it was all he could do to supply the needs of the day. He was without tools, without weapons, without fire, without the experience of working with others, and almost entirely dependent upon his own efforts. In many respects Nature was kind to him. She placed him in a mild climate and in a region surrounded with wild plant foods. But there was danger at every hand, and he was filled with fear. The sabre-toothed cat, the fiercest beast of prey ever known, made his home in the neighboring caves; cave-bears, tigers, wolves and hyenas lurked in the thickets; hippopotamuses and rhinoceroses wallowed in the marshes and splashed in the rivers and lakes; wild cattle, horses, bison and other grass-eating animals fed on the hillsides and on the grassy plains.

The safest place of refuge for man was in the branches of the tall trees. He was not able to cope with the wild beasts. Most of the animals were stronger than he and were specially fitted for the fierce struggle for existence; man alone in the animal kingdom was not provided with adequate means of attacking the wild beasts or protecting himself from their attacks. He was not like the tiger, that could tear and rend with its sharp teeth; he was not like the rhinoceros, that could trample one under its feet; nor was he like the wild horse, that could strike hard blows with its hoofs. It would thus seem that man was not intended for fighting but for work of a different kind, and we find that even the lowest savage was truly fitted for a different kind of work. In certain respects he was superior to any of the wild beasts. No wild beast was able to *think,* as man could think; no beast could *do as many things* as man could do; no wild animal gave its young training and care for so long a time as the savage did. Man, in lowest savagery, thus stands out from the brute world on account of the fact that he is a "thinking animal" who educates his young for a long period. Nature soon gives the young animal skill of its kind, but the young child needs training as well as protection for several years.

Had the lowest savage known enough, he might have established civilization through the exercise of the characteristics which distinguish him as man and separate him from the beasts. But he did not know enough to

do it. The story of civilization is the story of how he learned to do it. The earliest chapters tell how he used intelligence at first in fighting the wild beasts and in taking what he needed without thought of giving anything in return. He was destructive because he was ignorant. It is no wonder that he remained in savagery tens of thousands of years. He did make some progress, however, and we all owe him a debt of gratitude, for it was man of lowest savagery who first conquered fire.

Before the conquest of fire, man undoubtedly saw many forest fires, which may have been kindled by lightning. It was a brave man who first dared venture near the fire-monster. And undoubtedly it was the desire to gain the good will of the fire-monster that led to the practice of "feeding the fire" by piling sticks upon it. At any rate we know that the savage worshiped the fire just as he worshiped the powerful and much-dreaded beasts of prey.

Man soon found out that fire was an invaluable ally. When he had fire at the foot of a tree, wild animals kept away from the spot. He was thus able to come down from the branches and make his home at the foot of a tree. Other tree-dwellers, seeing and hearing something about it, were curious, and one by one they came to the spot, and they soon formed a clan. The fire needed attention, so quite naturally the women with little children stayed near the fire, while the men went farther away in their search for food. When the men returned from an exciting hunt, they were eager to tell the women about it. Not having a well-developed language, they gathered around the fire and acted out the story of the hunt and thus invented the dance, which embodied music and poetry.

Little by little it was found that fire could be used in hunting, in making weapons and in cooking. Each of these discoveries was the result of thinking; each made the struggle for existence a little easier than it nad been before. The conquest of fire thus marks the entrance of man from lower to middle savagery.

Middle Savagery. The story of middle savagery is the story of how man, armed with fire, took possession of the caves; how, thus protected, he had more leisure and was able to make better weapons; how people learned to work together; how they gained courage to meet the wild beasts in open combat; and how, when they learned to cook fish, they became free to wander up and down the streams throughout the greater part of the world. This age has been called the *rough stone age,* because of its rough stone weapons. Among these the stone ax and the spearhead are the most characteristic forms.

Higher Savagery. In lower savagery man was afraid of wild animals; in middle savagery he gained courage to meet them in open combat; in higher savagery his courage grew and he invented weapons he could hurl through the air faster than the swiftest animal could run. It was then that the animals became afraid of man. At first weapons were thrown from the hand. Then a throwing stick was invented, and finally there appeared that epoch-making invention, the bow and arrow.

It was during this period that *tools* were made, as distinct from *weapons.* Among these were knives, files, saws and needles. The invention of tools made it possible to use unshaped material such as bone, horn and ivory in the manufacture of weapons. Many such weapons, with beautifully-carved handles, were made by the reindeer hunters of Western Europe during the Glacial Period (which see).

During higher savagery man had some animal pets, but no animal except the dog was really domesticated. The dog proved to be a great aid to man, not merely in hunting but in the domestication of the grass-eating animals in a later time.

Lower Barbarism. The invention of pottery, which gave man permanent cooking utensils that could withstand the heat, was the dividing line between savagery and lower barbarism. Previous to this cooking was a tedious process, and consequently much food was eaten in a raw or partially-cooked state. But with permanent cooking utensils that could be carried from place to place the custom of serving well-cooked foods became established; and man, being better fed, was not so irritable as he was in savagery, when he was likely to gorge in times of plenty and go hungry in times of famine.

The domestication of animals and the cultivation of plants mark the greatest change in man as he passed from savagery to barbarism. The savage, we have seen, was content to take Nature's gifts, with no thought of giving anything in return. Such destructive methods resulted in exhausting the hunting grounds; and so gradually the women learned to sow seeds and make little gardens and to raise the young animals brought home from the hunt. They began to learn to protect the plants in return for their fruits; they found that the

care they gave to their animal pets was repaid in times of famine by milk or meat.

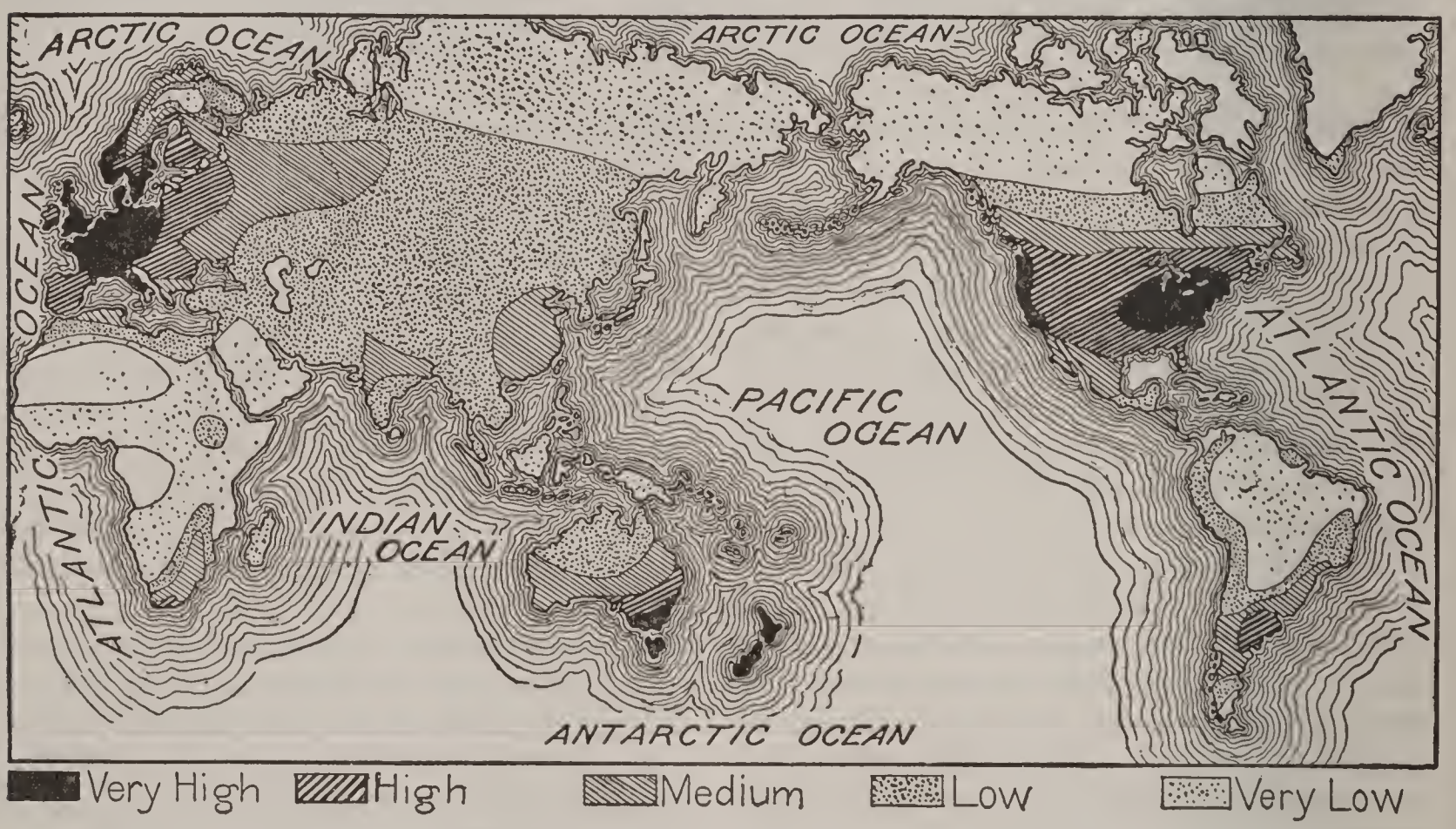
Middle Barbarism. In this period we find a more extended practice of agriculture, carried on not merely by the women but by men who were captured in warfare. In many places it was found that the grass-eating animals, when protected from enemies, multiplied very rapidly; so men as well as women took up the work of domesticating animals, and they soon had large flocks and herds. Man thus learned to be more sympathetic toward the grass-eating animals and toward the people of his clan, but he still regarded strangers as enemies and enjoyed nothing better than making a raid on neighboring tribes and driving away their flocks.

It was during this period that animals were first used for carrying burdens and also as draft animals; and as life became more settled better dwellings were erected, adobe brick coming into use at this time (see ADOBE).

Higher Barbarism. The discovery of how to smelt iron ore and fashion it into tools and weapons is the great discovery which characterizes the period of upper barbarism. The use of iron made it possible for people to have better tools and weapons and to progress at a far more rapid rate than before. Forests could be cleared with the iron ax, and many forests were soon transformed into arable land and meadows. With the division of labor and development of trade, cities grew up. Here the ruling classes lived, protected by stockades or walls, while slaves and serfs lived outside and cultivated the land. The Homeric Greeks, the early Italian tribes, the Germans of the time of Tacitus and the Norsemen of the Viking age are examples of higher barbarian culture.

Lower Civilization. The discoveries and inventions of savagery and barbarism were worth so much to succeeding ages that the wise men and women who made these discoveries were deified as gods. It was not easy to hand down exact knowledge in the early ages. Stories were likely to be changed, and the picture writing of the savage and the hieroglyphics of the barbarian were clumsy ways of preserving records. With the invention of the alphabet knowledge was more easily preserved. This invention has been made the dividing line between barbarism and civilization. Lower civilization covers a period extending from 4000 to 5000 B.C. to the fifteenth century A.D. Ancient Egypt, Babylonia, Phoenicia, Carthage, Greece and Rome are examples of this stage of culture. In these countries labor was performed by slaves. The ruling classes looked down upon the slaves and upon slave labor. Progress was made by the upper classes in the arts and sciences, but no one applied this knowledge to the work by slaves.

Ancient civilizations were in constant fear either of uprisings on the part of the slaves and serfs or of being overrun by barbarian



THE DEGREE OF CIVILIZATION TO-DAY

Darkest region shows most advanced stage of the sciences and highest conventional development of the arts.

hordes. The invention of gunpowder wrought such a change in warfare that it marks the advance to middle civilization. The use of gunpowder enabled civilized peoples to protect themselves from barbarian hordes from without; and with the freeing of the slaves it enabled the masses of the people to protect themselves from the oppression of the ruling classes who lived in fortified castles or behind city walls.

Middle Civilization. While the use of gunpowder was "leveling down" the power of the mighty, the invention of printing was "leveling up" the intelligence of the people. The dense ignorance which had characterized the masses of the people began to disappear. Printing was a tremendous power in removing ignorance and prejudice. It began to draw people together and to arouse a desire for knowledge of other peoples and other lands. The mariner's compass in the hands of Columbus, who had learned from the Greeks that the earth was a sphere, made it possible for that brave man to locate the New World. A little later the bold Copernicus (which see) opened up a new world of knowledge. For the Copernican theory gave a satisfactory explanation of much that had hitherto been unknown. "The cause of day and night, of climate, seasons, of the earth's velocity, weight, size and shape, of latitude, longitude, the eclipses, the moon's phases, the exact length of the solar year, together with those wonderfully-minute calculations tabulated in our almanacs and textbooks on astronomy"—these were no longer mysteries.

Middle civilization began in the fifteenth century and was brought to a close during the last years of the eighteenth by the application of steam power and machinery to the manufacture of cotton cloth. Fire told its secret to Watt, and Watt gave the world the steam engine.

Higher Civilization. Modern civilization has witnessed the triumph of mind over matter. Material obstacles which have so long separated men have been overcome. The task of this age is to remove the mental qualities which separate men. Fear, envy, jealousy, greed and hate are among the "wild beasts" of to-day. And just as the savage set himself to the task of waging warfare upon the sabre-toothed cat and other dangerous beasts, so many people to-day are setting themselves to the task of destroying the mental "beasts of prey." This is a warfare in which every girl and boy may take part; for every girl and every boy can refuse to entertain these "wild beasts," and thus let them die of starvation. In this way every girl and boy can have a good part in the story of civilization. K.E.D.

CIVIL LAW, the name usually given the code of laws compiled by the Roman Emperor Justinian (which see), in A.D. 530, and later forming the foundation of the laws of all the countries of Europe except England. Civil law includes both public and private law, and in Europe the term is now used to include all laws relating to the private rights of citizens as well as the laws regulating the powers of the state. *Civil law,* from the Latin, *civis,* meaning *citizen,* does not deal with crime; that lies wholly within the province of *criminal law.* It comprises the laws which govern a man in his relations with his fellow man in civil life. When to break a law affects only the persons directly concerned, civil laws are invoked; when a crime menaces the right to life and protection it is prosecuted under the criminal code. To illustrate: Should A buy a horse of B for $150 and later discover the horse to be blind, when B had represented him as "sound," A might sue B for damages under the civil law; but should C break into A's barn and steal the horse A would have him prosecuted under criminal law. See COMMON LAW; EQUITY; LAW.

CIVIL LIST, that part of a country's revenue appropriated annually by the government for the private use of its heads, either as salaries or as salaries and for official uses. In republics it covers the salaries and expenses of the President and civil officers; in other countries it is a sum set aside for the king, queen or emperor and the royal households. The term originated in Great Britain, where originally it covered the support of all civil officers such as judges, ambassadors, secretaries, etc., as well as the royal household, but the Civil List Act of 1901 excluded everything but salaries and expenses for maintaining the dignity of the Crown. The following salary list will show interesting comparisons, but it should be remembered that in most cases, even when not mentioned, the rulers receive an additional allowance for expenses which are necessary to the proper performances of their duties, but are not strictly official:

Argentina, President	$ 24,000
Rumania	230,838
Denmark	270,552
Chile, President	6,559
France, President	115,800

Great Britain and Ireland, King and Queen receive (including expenses) ..	2,288,900
Ex-Queen Alexandra, Prince of Wales, and royal family also receive allowances.	
Greece, King	389,600
Italy, King	2,922,000
Netherlands, Queen	240,000
Also a large revenue from domains.	
Norway, King	187,719
Portugal, President	12,652
Spain, King	1,363,600
And allowances to royal family.	
Sweden, King	381,077
Turkey. The Sultan's income is derived from revenue of Crown domains, about	5,000,000
United States, President	75,000

The former German emperor enjoyed an income of $3,737,186 as salary, and large returns from private property. The income of the czar of Russia was never known; he had a private estate of over a million square miles of cultivated land and forests, and gold mines of great value in Siberia. He possessed the largest royal income of any of the world's monarchs.

CIVIL SERVICE IN THE UNITED STATES. The business of the United States government, not including the army and navy, is of such vast proportions that it requires nearly half a million employees of both sexes to conduct it. The government is by far the largest employer in the country. Furthermore, this extensive business embraces a great variety of occupations, some of which require only laborers, while others call for highly-trained experts. This branch of service forms the *civil service* of the United States. Formerly all these positions were filled by appointments, and one of the chief qualifications of an applicant for any position was his ability to secure votes for the party in power, but more especially for the candidate for Representative in Congress from his district. In other words, government positions were granted as rewards for partisan political activity, and the fitness of the applicant for the position was too frequently a minor consideration.

Civil Service Law. Under this system of political appointments, the business of the government became so demoralized that Congress was compelled to take action, and in 1883 the Civil Service Act was passed. The purpose of the act as declared in its title is "to regulate and improve the Civil Service of the United States."

Commission. The law provided for the appointment by the President of three commissioners, a chief examiner, a secretary and such other officers and employees as may be necessary. It was the duty of the commissioners to aid the President in making such rules as might be necessary to carry the act into effect. They now make all rules governing examinations and make an annual report touching upon the enforcement and effect of these rules.

Rules. The service is classified into departments known as departmental service, customs service, postal service, internal revenue service, government printing, railway mail, pension, lighthouse, Indian schools, insular possessions, life saving, etc. Because of this classification the civil service has become officially known as the *classified service.* The commission is required to make rules for filling positions in all classes of service by open, competitive examinations for testing the fitness of applicants, and for filling vacancies by selections among the successful candidates having the highest grades.

No person employed under the Civil Service Act is obliged to contribute service or money for political purposes. All employees may vote as they please and have perfect freedom to express privately their political opinions; but they are forbidden to take an active part

in political campaigns, or to use their official authority or influence to compel one to vote or to work for any candidate or measure.

Applications. One seeking to enter the classified service must file an application blank. The blank for the departmental service at Washington, railway-mail service, Indian-school service and governmental printing service are obtained from the Civil Service Commission at Washington. The blanks for customs, postal and internal revenue classes should be procured from the civil service board of examiners in the city where the examination is to be held. The Commission at Washington will mail to any person a list of cities in which examinations are to be held, with dates. The applicant should state specifically the class of service he wishes to enter, as stenographer, bookkeeper, clerk, etc., and state whether or not he is willing to take a position outside the United States, in the insular possessions.

Applicants must be citizens of the United States, and of the proper age. The age limit varies for different classes of service, but it is not enforced against former members of the army and navy of the United States honorably discharged because of disabilities incurred while in active service. No discrimination is made because of sex, color, or political or religious opinions, but persons using intoxicating liquors to excess will not be considered.

Examinations. Two examinations are held each year and they are open to all persons qualified to enter the class for which the application is made. The examinations differ for each class of service. Full information concerning them can be obtained from the Commission or the board of examiners. The applicant should apply for this information far enough in advance to enable him to prepare for the test.

Appointments. When a vacancy occurs, the highest three (in examination averages) of the sex called for are certified for appointment. In making this recommendation for the departmental service at Washington the apportionment of employees among the states is considered. Appointments are made on a six months' trial. If during that time the appointee proves his worth, his position becomes permanent. There are in all about 470,000 in the classified service of the United States, and naturally vacancies are numerous.

Exemptions. Officers appointed by the President and confirmed by the Senate are not under the civil service law. These officers may appoint private secretaries and other helpers whose services are of a personal nature, without subjecting them to examination, and they are not protected in their tenure of office.

State and City Civil Service. In most states the heads of departments such as the secretary of state, state auditor, state treasurer and superintendents of schools are elected by the people. Since each of these officers is usually empowered to appoint his assistants, there is not so good an opportunity for applying a civil service law to state governments. New York maintains a state civil service law, the operation of which is in charge of the civil service commission of the state. Large cities afford excellent opportunity for the application of civil service, and many have civil service ordinances. Since these ordinances are passed by the city council, however, they are liable to frequent changes, and the rules of the commission are often broken to make places for favored people.

Civil Service Reform. Attempts to improve the civil service are known as *civil service reform.* Ever since its organization the government of the United States has suffered more or less from the abuse of the appointing power of high officials. In 1832 in a debate in the Senate, Daniel Webster set forth the ideal which should be the aim in civil service. He said:

> The theory of our institutions is plain; it is that government is an agency created for the good of the people, and that every person in office is the agent and the servant of the people. Offices are created, not for the benefit of those who are to fill them, but for public convenience.

When the government was organized, Washington and the members of his Cabinet exercised great care in appointing men to public office and tried to secure those who were especially fitted for the duties to which they were appointed. Their example was followed by succeeding administrations, and for the first thirty-nine years under the Constitution there were only 112 removals from office, and each was for a good cause.

The Spoils System. With the inauguration of Jackson there came a radical change in political methods. Jackson removed from office not only heads of departments, but all subordinates who voted or worked against him in the campaign, and filled their places with his followers. Thus was founded the *spoils system,* so called from Senator William Marcy of New York, who in a speech in the Senate

in 1832 laid down the principle that "to the victors belong the spoils of the enemy."

Each succeeding administration followed Jackson's lead, and a wholesale removal of office-holders on a change in the Presidency was taken by the country as a matter of course. At each change of administration Washington was thronged by office seekers—many of whom had the support of their Senators and Representatives in Congress. Parties were divided into factions, and thousands of incompetent men were appointed to positions of trust and responsibility, to satisfy political demands.

The Merit System. Government business, under the spoils system, reached a deplorable state, and thoughtful men began to seek a remedy; but it was a difficult matter to secure necessary legislation. In 1871 a bill was passed authorizing the President to make rules for admission to the civil service through competitive examinations, and to appoint a civil service commission. President Grant appointed the commission and a system of examinations went into effect in the year 1872. This law continued in force for three years, when the political spoilsmen in Congress defeated the appropriation for the commission and it was obliged to abandon the work. The spoils system was again in operation for six years. In 1881 the quarrel over patronage in New York led to the assassination of President Garfield. Immediately public sentiment against the spoils system rose to such a high tide that the next Congress (1883) enacted the present law, the scope of which has been several times extended. The last extension, and one of the most important, was to include all postmasters of the fourth class (in the smaller offices) in the classified service. E.D.F.

Consult Fairlie's *National Administration of the United States;* Fish's *The Civil Service and the Patronage.*

Civil Service in Canada

Efficient Organization. Thorough organization of the civil service has been slow in Canada, as in other countries, but it has been effective. The object of the organization is to obtain the services of capable employees and ensure the efficient working of all governmental departments. All employees of the Dominion of Canada, with the exception of the heads of departments, are now included in the civil service lists. The service is divided into *inside* and *outside* branches. The *inside* service consists only of employees in the governmental departments at Ottawa; the members of the *outside* service come more directly in contact with the public, as customs, railway and post and telegraph employees.

The civil service is controlled by two commissioners, assisted by a secretary, all three officials being appointed by the Governor-General in Council. The commission, whose headquarters are at Ottawa, holds examinations and passes upon the qualifications of candidates for admission or promotion in the service. Admission and promotion are competitive, length of service not being regarded as a recommendation unless accompanied by proved ability. All employees on the civil service list are compelled to pay five per cent of their salaries into a pension fund. Those having served for ten years or upwards or having reached the age of sixty years, are entitled to a pension; after ten years an employee retired or rendered incapable by bodily infirmity from performing his duties draws a pension of ten-fiftieths of his average salary for the previous three years. For every extra year of service he is entitled to an additional one-fiftieth. The legal heirs of an employee who dies while in the service inherit the pension due at the time of death.

The Civil Service Insurance Act of 1914 provides insurance for civil service employees, both male and female. W.F.Z.

CIVIL WAR IN AMERICA. See War of Secession.

CLAIBORNE'S REBELLION, *kla'born's re bel'yun.* In about 1631, William Claiborne, an energetic, resourceful colonial adventurer, established a trading post on Kent Island, in Chesapeake Bay, inducing many settlers to locate there. This settlement was then granted membership in the Virginia Assembly. Three years later, however, Lord Baltimore, under the Maryland charter he had received in 1632, claimed title to Kent Island, stating that Claiborne's rights were merely for purposes of trading. Claiborne rebelled and claimed independence and ownership; in these claims he was supported by Virginia. For years the dispute and rebellion lasted, causing loss of life and property, so Claiborne has often been called the evil genius of Maryland. Finally, in 1776, Virginia released all claims to the territory beyond the Potomac River, and the ambitions of the obstinate Claiborne were thus defeated.

Claiborne the Rebel is a novel by W. H. Carpenter, based on the career of this colonist.

CLAIMS, *klaymz,* Court of, a court which settles claims against a government. In the United States such a court was established by act of Congress in 1855, and the legislatures of several of the states have created state courts of claims modeled on the national tribunal. The United States Court of Claims consists of a chief justice whose salary is $8,000 a year, and four associates with a salary of $7,500 each. Annual sessions are held in Washington, beginning on the first Monday in October.

This court has jurisdiction over all claims of citizens against the government, except those relating to pensions, or upon any regulation of an executive department, or upon any contract entered into with the Federal government. Its jurisdiction is not extended, however, to any claim arising from a treaty with foreign nations or Indian tribes. In cases where the amount in dispute is more than $3,000, appeal may be made to the Supreme Court of the United States within ninety days after the decision is rendered.

In Canada, claims against the Dominion government for injury suffered in the construction of a public work are heard by the Exchequer Court of Canada. There is no tribunal under the name court of claims in the Dominion.

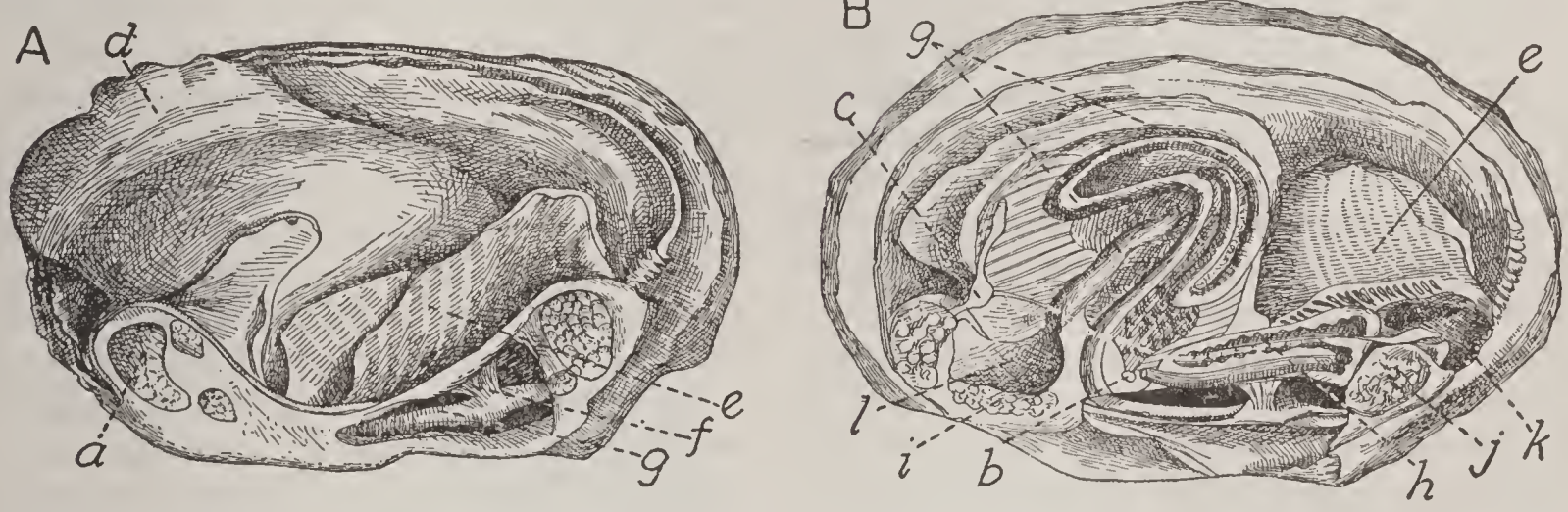
CLAIRVOYANCE, *klair voi'ans,* the alleged power to see beyond the range of human vision, or through opaque objects; also to foresee the future. It is sometimes called *second-sight,* a term applied among the Scotch Highlanders. It is a widespread tradition and is connected with the more ancient notion of the possession of supernatural powers by favored individuals. The notion was revived in connection with the practices of mesmerism and of Spiritualism.

Relating to Various Beliefs. The articles on the following topics, while not bearing directly on clairvoyance, are of interest in this connection because they, too, deal with pseudo-sciences or superstitions:

Alchemy	Palmistry
Astrology	Phrenology
Conjuring	Physiognomy
Demonology	Psychical Research
Divination	Psycho-Analysis
Faith-Cure	Spiritualism
Hypnotism	Subconscious
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind-Reading	Theosophy
Necromancy	Trance
Occult	Witchcraft

CLAM, *klam,* a salt-water shellfish highly valued for food, especially on or near the seacoasts. The Pilgrims learned from the Indians the value of this bivalve mollusk with its tightly-closing double-hinged shell (see Mollusks). The Indian name *quahog* is given to the hard-shell clam, which has a nearly globular shell and was employed as money by the Indians (see Wampum). The quahog does not burrow, but, standing erect on its thin edge, shoves itself along the sandy sea bottom. It is found from Cape Cod south. The young are known as *little necks,* after Little Neck, Long Island, where they were first found. These clams are obtained by raking.

Down in the gravelly bottoms of river mouths from South Carolina to Greenland, in San Francisco Bay and on the British coast, are found the *soft-shell* or *sand clams.* Their



CROSS-SECTION OF THE CLAM

A—Right Valve of Shell, to show internal organs.
(*a*) Anterior muscle for closing shell.
(*b*) Opening of reproductive organ.
(*c*) Brain.
(*d*) Foot.
(*e*) Gill.
(*f*) Heart.

B—Dissection.
(*g*) Intestine.
(*h*) Kidney.
(*i*) Liver.
(*j*) Rear muscle for closing shell.
(*k*) Space through which water passes in leaving shell.
(*l*) Stomach.

shells are smooth, thin, chalky and somewhat oval. They have siphons often longer than the shells themselves, the tips of which are all that appear above the surface of the sand. When disturbed they send forth spurts of water and pull the siphons out of sight. These clams are secured by digging at low tide. Though not quite as good as quahogs, there is a large demand for soft-shell clams. They were the ones originally used in the famous Rhode Island clam chowders and at the New England clam bakes. Soft-shell clams have also been used for bait, and the walrus, the Arctic fox and many birds will eat them. The food of all clams consists of the tiniest animals of the sea.

A *giant clam* is found on the coral reefs of the Pacific, its shell alone weighing 400 pounds or more. Natives of the Caroline Islands often use parts of its sharp-edged shell for axes.

The term *clam* is also applied to fresh-water mussels. See MUSSEL.

CLAN, *klan,* originally a body of men bound by the ties of blood relationship, having a class name and a tribal organization ruled by a chief. As later used the word meant a body of persons closely united by some common pursuit or interest to the exclusion of other persons, with no regard to family ties.

The clan system existed in early times, and is said to have sprung up about 1008 while Malcolm II of Scotland was king, and was peculiar to the countries of Ireland and the Highlands of Scotland. The term was used by the large septs or tribes into which the Irish were divided, but more especially by the numerous families in the Highlands. Among the Highlanders there was no liking for written agreements or charters, so the feudal system had but little hold; the clansmen were governed by men of the same blood, being united by descent from a common ancestor, the obligation of all the members to avenge one another's injuries being the most common principle.

When by the rise of towns and by conquest the tribal system began to be broken up and a common surname was needed for keeping up such connection, a chieftain of a tribe selected some ancestor and called himself by that name with the prefix *Mac,* meaning *son.* All of his kindred adopted the same name, and in Scotland *Mac* came to be generally used in the great clan which included the smaller clans of the MacDonalds, MacGregors, etc. The clansmen had the utmost reverence for their chief or lord, and obeyed his commands without question. Each clan occupied a certain portion of land and among neighboring clans hostilities were frequent.

After a rebellion in 1745 and the disarmament of the clans, the system was practically broken up, though in the more remote districts of the Highlands the old popular beliefs linger, and the interesting poetical traditions survive in the memories of the people.

CLAR'ENDON, EDWARD HYDE, Earl of (1609-1674), an English historian and statesman, who filled an important place during the reigns of Charles I and II. He began his political career in 1640 as a member of the Short and Long Parliaments summoned by Charles I, and, having become a leader of the king's party in the House of Commons, threw in his lot with the Royalists on the outbreak of the civil war. He accompanied Prince Charles (afterwards Charles II) in his flight to Jersey, remaining on the island for two years and beginning there his great literary work, *History of the Rebellion.* In 1643 he was knighted and made Chancellor of the Exchequer. Clarendon made every effort to save the life of Charles I, and was equally zealous in promoting the restoration of Prince Charles. In 1658 he was formally declared Lord Chancellor, and for several years was the trusted adviser of Charles II, but, having gained the ill will of the people because of the unsuccessful Dutch War and the sale of Dunkirk to the French and having offended the king by opposing the latter's divorce, he fell from power and spent the last six years of his life in exile.

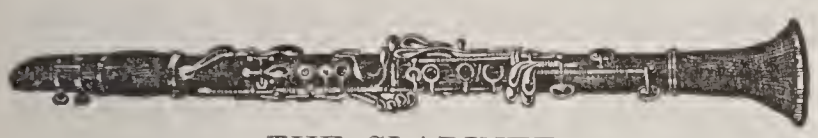
Related Subjects. The following articles in these volumes should be read in connection with the life of the Earl of Clarendon:

Charles (I and II)	Cromwell, Oliver
Commonwealth of England	Restoration, The

CLARET, *klair'et,* or **BORDEAUX,** *bawr doh',* a still, dry, sour, red wine—still, because it does not contain a gas which makes it sparkle. The claim is made that it is one of the most wholesome of wines, and it formerly was used extensively as a tonic for invalids or convalescents. This wine has very little sugar. The genuine clarets were originally made in France, mostly at Bordeaux. The plant-louse (*phylloxera*) wiped out so many vineyards, however, that for years many cheap mixtures have been sold as claret. Also the War of the Nations after 1914 almost stopped

its manufacture in France. A genuine claret is made in California, and it is a popular wine in that region.

CLARINET, *klair'i net,* the leading instrument in military bands; in fullness and variety of tone it is considered the most perfect of wind instruments. It is usually of wood, with a trumpet-shaped mouthpiece, in which is



THE CLARINET

placed a thin reed, the vibrations of which produce the tones; the fingers playing on keys covering holes in the tube produce the melody. A range of three and one-half octaves is covered, but not every key can be played on one instrument, so clarinets of different pitch are used. In orchestras the A and B♭ clarinets are used, sometimes the high and the bass C. Mozart, with his symphony in E♭ major, made the clarinet a permanent orchestra instrument. See ORCHESTRA.

CLARK, CHAMP [JAMES BEAUCHAMP] (1850-1921), one of the best-known leaders in the Democratic party of the present day. In 1913 he was honored with the most influential office in the United States below the Presidency, the Speakership of the House of Representatives. He was born in Kentucky, attended the common schools, was graduated at Bethany College, West Virginia, and then from the Cincinnati Law School. Before he became prominent in politics he worked as a farm laborer, clerk, editor and lawyer, and served as president of Marshall College, in West Virginia. In 1880 he began the practice of law in Bowling Green, Mo., and nine years later was elected to the national House of Representatives; he has represented Missouri in that body continuously since then, except for two terms, from 1891 to 1893 and 1895 to 1897.

JAMES BEAUCHAMP CLARK

Speaker of the United States House of Representatives from 1911 to 1917.

Clark became Democratic leader in the House in the second session of the sixtieth Congress, and in 1911, when a heavy vote against the Republican party caused the Democratic landslide in the Congressional elections, he was elected Speaker of the House. During the Presidential campaign of 1912 his great personal popularity was shown in the spring primaries, where he sought pledges for the Presidential nomination, and he was one of the strongest candidates in the Baltimore convention of that year; Woodrow Wilson, however, was nominated after more than thirty ballots, and Clark supported him in the ensuing campaign. He was Speaker for eight years.

CLARK, CHARLES HEBER (1841-1915), an American humorist, better known under the pen name of MAX ADELER, author of the amusing books *In Happy Hollow, Elbow Room, Random Shots, Out of the Hurly-Burly* and *Desperate Adventures.* In 1865 he engaged in journalism, devoting most of his time thereafter to that work. While editor of *The Manufacturer,* the organ of the Manufacturers' Club of Philadelphia, economic subjects occupied much of his editorial attention.

CLARK, FRANCIS EDWARD (1851-), founder of the Young People's Society of Christian Endeavor, and editor of the *Golden Rule,* the paper of that organization. He was born in Aylmer, Canada. After graduation from Dartmouth College and Andover Theological Seminary he became a Congregational clergyman. From 1876 to 1883 he was pastor of a church in Portland, Me., and he spent the following five years in charge of a Boston church. Since then Mr. Clark has devoted his time to Christian Endeavor work, traveling around the world five times in its interests and serving continuously as president of the United Society. See CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF.

CLARK, GEORGE ROGERS (1752-1818), a famous American soldier and frontiersman, whose military successes in the old Northwest during the Revolutionary War gave the United States its chief claim, in the peace negotiations, to the territory between the Mississippi River and the Alleghany Mountains. He was born near Monticello, Va., received a common school education and began his career as a land surveyor. At the beginning of the Revolution he was chosen a delegate to represent Kentucky, then a district of Virginia, in negotiations which resulted in organizing Kentucky as a separate county.

In 1778, having become lieutenant-colonel, Clark raised a force of troops and began the conquest of the Northwest by capturing Kas-

kaskia, the oldest town in Illinois, from the French; this victory he followed up by seizures of the other French villages, Cahokia and Vincennes. In 1780 he accepted a command under Baron von Steuben to defend Virginia against the British, and from that time on until the close of the Revolution he was engaged in active warfare against the English and the Indians, winning many notable victories and in 1782 destroying five Indian villages on the Scioto and Miami rivers. Ten years after the close of the war he accepted a commission as major-general to recapture Spanish possessions on the Mississippi for the French, but the plan was not carried out. His last years were spent in retirement on part of an estate in Indiana which he had received from the Virginia legislature.

CLARK, WILLIAM (1770-1838), an American soldier and explorer who is remembered chiefly for his association with Meriwether Lewis in an expedition to the Pacific coast, to explore parts of the new Louisiana Purchase. He was born in Virginia, and at the age of fourteen removed with his family to the site of Louisville, Ky. Eight years later he joined the army as lieutenant of infantry, and in 1794, under General Wayne, took part in a campaign against the Indians. In 1796 he resigned because of ill health, but in 1803 again entered the army and was commissioned second lieutenant. The following year Clark and Lewis began their memorable exploring trip westward, traveling 8,500 miles in two and one-half years. Clark was later made Indian agent for Upper Louisiana, was governor of Missouri territory between 1813 and 1821, and from 1822 until his death held office as superintendent of Indian affairs at Saint Louis. He was the youngest brother of George Rogers Clark (which see).

See LEWIS AND CLARK EXPEDITION, accompanying which is a map of the route followed; also LOUISIANA PURCHASE.

CLARKSBURG, W. VA., one of the leading industrial cities of the state, is the county seat of Harrison County. It is situated in the western hills of the Alleghany Mountains, in the north-central part of the state, on the main line of the Baltimore & Ohio Railroad. An electric railroad connects the city with the surrounding towns. Wheeling is ninety-seven miles northwest, Parkersburg is eighty miles west, and Baltimore is 316 miles east. The population in 1910 was 9,201; in 1920 it was 27,869.

Clarksburg is called "The Fuel City of the Fuel State." Within a radius of twenty-five miles are ninety coal mines, which yield 9,000,000 tons annually. Natural gas and oil are accessible in almost unlimited quantities. Hardwood timber and glass sand are abundant. The most important enterprises are glass, glass bottle and fruit jar manufactories; art pottery, dishes, etc., are made, and there are chemical and carbon works and cigar factories, wood-working plants, machine shops and foundries. In 1920 there were 86 factories, employing nearly $8,000,000 capital.

The Federal building, erected in 1888 at a cost of $100,000, and three large hospitals are among the important public buildings. Saint Joseph's Academy and a commercial college supplement the public school system. Broadus College, once here, is now in Philippi.

The city was settled in 1772, and named for the pioneer soldier, George Rogers Clark. It was incorporated in 1849 and obtained a city charter in 1897, under which it is now governed. Clarksburg was the birthplace of "Stonewall" Jackson.

CLARK UNIVERSITY, an institution for post-graduate study, founded in 1887, at Worcester, Mass., by Jonas Gilman Clark. The successful development of the university is due in large part to the distinguished educator who became its first president, G. Stanley Hall (which see). The institution was founded to give educators and specialists opportunities to do research work along their particular lines. Students carry on their studies with a good deal of independence, while the instructors act as guides and advisers. A college department, known as Clark College, was organized in 1902, a fund of $1,300,000, left by Mr. Clark, being used for this purpose. The university faculty numbers about thirty, and the student body, about 220. Among the journals published by the institution are the *American Journal of Psychology* and *The Pedagogical Seminary.*

CLASSICS, a name applied very generally to writings of the highest rank, but more especially to the best literary and art productions of the world—those that are accepted as standard. The period of most brilliant literary activity of any nation is usually referred to as its *classical period;* its best writings are known as its *classics.* Thus, Thackeray, Dickens and George Eliot are numbered among the classic novelists in English literature, and Shakespeare, Browning, Tennyson, Longfellow, Whittier, Poe and others of their rank are classics

among the poets. Because the greatest productions of ancient times have come to be regarded as the highest examples of literary excellence, the word is applied, in a narrower sense, to the best writers of ancient Greece and Rome, and *classic* and *ancient* are frequently used with the same meaning. The Doric, Ionic and Corinthian are known as the *classic orders* of Greek architecture. The term *classics* when referring to studies means usually the Greek and Latin languages.

CLASSIFICA'TION, an orderly arrangement of objects into groups, the objects in each group having some common resemblance. If a boy is given a number of circles, triangles and squares and told to "sort" them, he will place the circles in one group, the triangles in another, and the squares in a third. He has classified the objects according to shape or form. If the objects were of different sizes, he might classify them according to size, or if they were of different colors, he might classify them according to color. Again, supposing a child is given a collection of flowers which contains pinks of different colors, roses of different colors, and lilies, and is asked to put all the pinks in one group, all the roses in another and the lilies in a third; he then has a more difficult task, because in making his classification he must consider both color and form. If some of the roses are single and some double, the difficulty is increased, for in order to place all the roses in the rose group he must observe the plan and structure of the flowers.

The term *classification,* as applied to the study of plants (botany) and animals (zoölogy), means the arranging of all plants and animals in divisions and subdivisions, each of which depends upon some characteristic common to all objects that it includes. That is, all plants included in the Rose Family, or group, must bear some resemblance to the rose; all animals belonging to the Cat Family must have some characteristics of the cat. There are so many different kinds of plants and animals that this orderly arrangement became necessary to their systematic study, and scientists have for centuries worked upon systems of classification. As more facts are learned, the classification is modified to make it conform to the latest discoveries. Consequently no system of classification remains unchanged, though the changes that are made from time to time are usually made in the smaller groups or divisions.

In the formation of the largest groups only the most general characteristics are considered, as the division of all plants into flowerless and flowering plants. These great divisions are again divided according to some common characteristic. Flowering plants are divided according to the structure of their seeds. Those producing seeds with one seed-leaf (cotyledon) form the group monocotyledonous plants, and those producing seeds with two seed-leaves form the dicotyledonous plants. All animals that eat flesh form the flesh-eating (carnivorous) group and those that feed upon plants form the herbivorous group.

The above illustrations are sufficient to show what is meant by scientific classification. These various groups are usually arranged in the order of their importance, beginning with the largest and ending with the smallest. To all of these divisions Latin names are given, for three reasons. First, Latin was the language in which scientific works were written when these classifications were begun. Second, Latin is a dead language, and the meaning of the words does not change. Third, the use of Latin gives the same name to the object wherever it may be found. Many plants and animals are known by different popular names in different localities. The bird known as the *bobolink* in the northern part of the United States and in Canada is known as the *reed bird* in Ohio and the *rice bird* in the South. One unacquainted with this fact would naturally think that three different birds were named. If, however, the Latin name *Dolichonyx oryzivorus* were placed after each popular name we should know that these three names were applied to the same bird. For this reason the Latin or scientific name usually follows the common name of a plant or animal in our best works on botany and zoölogy.

The groups with which the general reader should be acquainted are the *species,* the *variety,* the *genus,* the *family* and the *order.*

Species. A species is a group of individuals which reproduce their kind and are so near alike in all particulars as to indicate that they may have sprung originally from the same parent stock. The seeds of the rose, for instance, reproduce the rose, and all roses are near enough alike to indicate that they are descendants of a rose plant.

Variety. But there are many different kinds of roses and we are not sure when we plant the seeds of any of these roses that another rose exactly like the one from which the seed was taken will be produced. These various divisions within the species are known as

varieties, or *sub-species.* Most varieties have been developed by cultivation, and they are of great importance to the farmer, the fruit grower and the florist. Consider the many varieties of corn, wheat and potatoes, each especially adapted to the locality in which it is raised, or the numerous varieties of apples and other fruits, and you at once see the importance of varieties.

Genus. The genus is the next group larger than the species. The term comes from a Latin word which with its plural *genera* has been incorporated without change of form into the English language. It means, literally, *kind* or *class,* but it is used in botany and zoölogy in a very special sense, and has a definite place in the classification of plants or animals. There is the oak tree, for instance; there are many kinds, which differ in the size and shape of leaves, the shape of acorns, the manner of growth and other particulars, and to make it clear just what sort of an oak is meant, some descriptive term must be added, as *white* oak, *red* oak, *live* oak. Now each particular kind of oak, as the white oak, is called a *species,* while all the different oaks are grouped into a large class known as a *genus.* In the same way a number of *genera* may be grouped into one large *family.* To be technically accurate, the genus name must be in Latin, and must be followed by the species name, also in Latin. Thus any oak belongs under the genus *Quercus,* but only a white oak can possibly be meant when the phrase *Quercus alba* is used.

Family. The family is a group of genera which have a common resemblance, "a family connection." The Rose Family, for instance, includes besides the rose, the apple, the plum, the strawberry, the raspberry and a number of other groups of plants whose flowers and fruit resemble those of the rose. The Cat Family includes not only the house cat, but the lion, the tiger, the leopard, the puma, the wild cat and a number of other animals, all of which are "great cats."

Order. The order is a group of families having a common resemblance, though it frequently happens that family and order mean the same. The order *Rosaceae* in botany means the same as the Rose Family; but the order *Carnivora* in zoölogy includes the Cat Family, the Dog Family and all other families of flesh-eating animals. See BOTANY; ZOÖLOGY. W.F.R.

CLAUDIUS, *klaw'di us* (10 B. C.-54 A. D.), a Roman emperor, whose reign is memorable because of his admission of the Gallic nobles of the empire to the Roman Senate and to the city offices. He was the son of Claudius Drusus Nero, stepson of Augustus, and had little part in public affairs until A. D. 41, when, on the murder of Caligula, he was declared emperor by the soldiers. His liberal spirit was shown not only in his treatment of the Gallic nobles, but in humane laws regarding freedmen, slaves, widows and orphans. In his reign the southern part of Britain was conquered and made a Roman province, and he himself gave his attention to the improvement of Rome. The Claudian Aqueduct, which he completed, brought water to the city from a distance of forty-five miles. The great blot upon his character was his weakness in yielding to the influence of intriguing wives and favorites. In A. D. 54 he was poisoned by his fourth wife, Agrippina, the mother of Nero. See AGRIPPINA.

CLAUDIUS

A coin of his reign, showing his head.

CLAX'TON, PHILANDER PRIESTLY (1862-), an American educator, appointed as United States Commissioner of Education in 1911; served until May, 1921. He was born in Bedford County, Tenn., and was graduated from the University of Tennessee in 1882. After teaching school for a year, he spent several years in studying educational systems in the United States and Europe. In 1888 he accepted the position of superintendent of schools of Asheville, N. C., but retired after five years to become professor of pedagogy in North Carolina State Normal and Industrial College. In 1902 he took the position of professor of education and inspector of high schools in the University of Tennessee, from which he resigned to become Commissioner of Education, by appointment of President Taft. Mr. Claxton is a member of the Southern Education Board, of the Rockefeller Sanitary Commission and of the council of the National Education Association. He is an occasional contributor to periodicals and delivers many addresses on educational topics. As Commissioner of Education he was particularly interested in bringing elementary education to a high state of efficiency.

CLAY, the earth used in making brick, tile and pottery. When dry, it is very hard and compact; when moist, its particles stick together and this makes it possible to mold it into any form desired. This peculiarity makes clay one of the most valuable materials used in the arts. All brick, pottery, tile and terra cotta are made from it; it can be rolled into thin sheets or drawn into rods which can be bent and twisted into any form, which makes it valuable in ornamental work. When moist clay is baked at a high temperature it becomes hard and will retain its form under high pressure, but we all know that a vessel made of clay is easily broken by a blow.

Clay is composed of silica and aluminum, and may contain small quantities of iron, calcium, magnesium, potassium and sodium. Most clay is formed by the decomposition of rock containing feldspar. It varies in color from nearly white to gray, dark blue and red.

The color of clay depends upon the presence of other substances than silica and aluminum. If it contains iron it usually turns red when burned. This is why we have red brick, tiling and pottery ware. *Porcelain clay,* or *kaolin,* is usually white or light gray. *Potter's clay* and *pipe clay* are similar to kaolin, but not so pure, and are used in making the cheaper grades of pottery. *Fire clay* will withstand intense heat, and is used for lining furnaces, for smelting iron and for making fire brick and crucibles. *Tripoli* and *fuller's earth* are varieties that are easily reduced to a fine powder; the former is sometimes used for polishing purposes. Clay is used in the manufacture of soap, in finishing paper to give it a glazed surface, in the manufacture of paint, and for adulterating food and for making filters.

Clay is an important constituent of soils. It absorbs ammonia and other gases necessary to the growth of plants and retains in the soil the fertilizing substances supplied by manure. Loam consists of clay mixed with sand and humus, and without a certain proportion of clay soil will not retain its fertility from season to season. Since water cannot pass through clay, layers of it underlying the soil prevent "leaching," that is, prevent the rain water from draining to lower layers of soil and gravel, thus leaving the soil dry.

Clay Modeling is a general feature of instruction in all kindergarten and primary schools. For information relating to this feature of education, see the article KINDERGARTEN. W.F.R.

Related Subjects. Students will find it advantageous to read the following articles in these volumes:

Brick	Marl
Calcium	Potassium
Feldspar	Sodium
Iron	Soil
Kaolin	Terra Cotta
Magnesium	Tile

CLAY, HENRY (1777-1852), one of the most distinguished leaders in American public affairs during the critical period of the anti-slavery controversy. He was born at a time when his country was fighting for independence from British rule, and died less than a decade before the bitter struggle over the slavery question reached its climax in the clash of arms between the North and the South. For thirty years he gave his best efforts to warding off that great conflict, thereby winning the title, "The Great Pacificator," that will be associated with him for all time.

Henry Clay was born April 12, 1777, the son of a Baptist clergyman of Hanover County, Va., who died when the boy was four years

old. He had few opportunities to attend school, and was forced to take a position in a retail business house at the age of fourteen, but he overcame his early disadvantages by his studious habits, love of reading and a naturally keen and alert mind. Having readily mastered the principles of law, he was admitted to the Virginia bar in 1797 and began practice at Lexington, Ky. Two years later, as a member of the state constitutional convention, he began his long political career. By this time, also, he had won local fame as a brilliant orator and as a lawyer who was able to win his cases.

Clay was sent to the legislature of Kentucky in 1803, and in 1806-1807 and 1810-1811 filled unexpired terms in the United States Senate. When first chosen Senator he had not reached the legal age required by the Constitution, and could not qualify for several months. In 1811, then thirty-four years of age, he entered the National House of Representatives, and was elected Speaker on the first day of the session. Five times thereafter he was reëlected to the House and to the Speakership, holding office continuously until 1825, except for the term between 1821 and 1823, when he returned to his law practice. At the very beginning of his career in the House he won popularity as an advocate of the War of 1812, and at its close was chosen one of the peace commissioners; he signed the Treaty of Ghent (1814), which concluded the struggle.

Resuming his activities in Congress on his return from the peace conference, Clay became a vigorous champion of the protective tariff and of the government policy of internal improvements (see CUMBERLAND ROAD), but these issues were soon overshadowed by the greater problems involved in the slavery question, destined to be the dominant issue for years to come. In 1820 he used his influence to secure the passage of the Missouri Compromise (which see), whereby Missouri entered the Union as a slave state. At this time he was first called "The Great Pacificator."

Though he was opposed to slavery and never hesitated to denounce what he called a "stain on the national character," the leading purpose in his public life was, in his own words, "the preservation of the Union," and in this patriotic ideal may be found the explanation of all his efforts to allay the strife between the pro- and anti-slavery parties. To him the quickest and most effective means of keeping peace was the policy of compromise.

In 1824 Clay was an unsuccessful candidate for the Presidency against Andrew Jackson, William H. Crawford of Georgia, and John Quincy Adams. Clay and Adams were then leaders of the newly-founded National Republican party, later known as the Whig. As no candidate had a majority of the electoral votes, the election was thrown into the House of Representatives. Clay, being fourth on the list, was ineligible, and therefore gave his personal support to Adams, who appointed Clay his Secretary of State. This appointment was the basis for a widely-circulated charge of corruption between Adams and Clay, which,

HENRY CLAY

though unfounded, was used to the latter's injury throughout his career, especially by his bitter political rival, Andrew Jackson. The harsh language used by John Randolph in denunciation of this supposed "deal" led to a duel between himself and Clay, in which neither was injured.

Adams showed excellent judgment in his selection of Clay as head of the State Department, but the latter felt that a seat in Congress offered the best opportunities for political leadership; moreover, he considered his absence from the House a hindrance in the attainment of what was now the great ambition of his life —the Presidency. Having vainly opposed the candidacy of Jackson in the election of 1828, he retired to private life at the end of Adams' administration.

Two years later, in 1831, the state of Kentucky again sent him to the Senate, where the tariff issue, bound up in the greater issue of slavery, once more engaged his attention. The South, which was bitterly protesting against the "tariff of abominations" of 1828, he endeavored to pacify by the more moderate law of 1832.

This measure, however, provoked threats of nullification and secession, and the next year he brought forward the famous compromise of 1833, which caused its author again to be hailed as "The Great Pacificator." Meanwhile, in 1832, he had been unanimously nominated for the Presidency by the Whigs, but in the election lost overwhelmingly to Jackson, largely because of his tariff record and because he unwisely made an issue of the National Bank.

During the Democratic administration of Martin Van Buren, Clay was an unsuccessful leader of the opponents of the independent subtreasury system. He was at this time steering a middle course in the troubled sea of the slavery dispute, thereby pleasing neither side. In 1839 he delivered a speech in which he declared himself the foe of slavery, but stated in no uncertain terms that the abolitionists were responsible for the discord that was threatening to disrupt the Union. Warned by his friends that this speech would ruin his chances for the Presidency, he made the often-quoted remark, "I would rather be right than be President."

In 1842 he retired from the Senate, and two years later was nominated for the Presidency against James K. Polk of Tennessee. Clay's hesitancy in taking a firm stand against the annexation of Texas alienated the abolitionists. In 1848 he was defeated for the Whig nomination by Taylor, but in the same year was reëlected to the Senate, and devoted the remaining years of his life to preserving peace between the Northern and the Southern states.

In 1850 he made his last great speech in the Senate in support of the Compromise of 1850, a group of measures that postponed for ten years the outbreak of the War of Secession. Time justified Clay's policy of compromise, for the last decade before the war gave opportunity for the strengthening of the sentiment of national unity, and enabled both sides to bear the shock of the great struggle which began in 1861.

During his career in the Senate Clay shared with Daniel Webster and John C. Calhoun the glories of that great trio of American orators. From a literary standpoint his speeches have not the excellence of Webster's, but his eloquence, personal magnetism, fine bearing, and above all, his voice, which was likened by his hearers to some delicately-attuned musical instrument, combined to produce an effect comparable to that produced by the oratory of his great contemporary. B.M.W.

Consult Barton's *Famous Americans;* Schurz's *Henry Clay;* Peck's *Party Leaders.*

Related Subjects. For a broader view of Clay's activities the reader is referred to the following articles in these volumes:

Adams, John Quincy	Nullification
Compromise of 1850	Political Parties
Jackson, Andrew	Tariff
Liberty Party	Whigs

CLAYTON-BULWER TREATY, a treaty entered into between Great Britain and the United States in 1850, and so named because it was signed after long deliberation between John M. Clayton, Secretary of State, and Sir Henry Bulwer, British ambassador. Both countries agreed to guarantee the neutrality of a canal through Central America, without exercising any control over the territory or in any way fortifying it. In 1901 the Clayton-Bulwer Treaty was abrogated and the Hay-Pauncefote Treaty came into force. Repeated attempts had been made to change the wording of the Clayton-Bulwer Treaty, giving America greater power over any inter-oceanic canal which might be built, and at times discussion of the subject led to strained relations between Great Britain and the United States. See Hay-Pauncefote Treaty; Nicaragua Canal; Panama Canal.

CLEAR'ING HOUSE. We are living in an age when time- and labor-saving devices are used in all branches of human activity. In modern banking the clearing house is such a device. It is an institution maintained by an association of banks in a city which secures a daily and speedy settlement of the claims each bank has against the others, with the least possible transfer of actual cash between them.

The Work of a Clearing House. A brief description of the method used in the New York clearing house, which serves as a model for all the others in America, is given below. Each bank sends to the clearing house at least two representatives, a so-called delivery clerk and a settling clerk. In a large room each bank is assigned a desk at which the settling clerk or clerks are seated. Upon arrival at the clearing house each clerk hands over to the manager

of the room a list of the amounts due to his bank from each of the other banks, as shown by the checks, drafts and other obligations which the clerk has brought with him. Promptly at 10 o'clock the delivery clerks begin passing from one desk to another, delivering to each settling clerk the bundles of claims of all sorts that their banks have against his banks. After each settling clerk has received all of them he draws up a statement containing the balance his bank should pay or receive. These statements are handed over to the manager of the room, who, after checking them, reads out the amount which each bank owes to all the banks or is entitled to receive from them. This work must be completed by 10:45 o'clock. Later in the day the amounts due by the debtor banks are paid in cash to the clearing house manager, who in turn pays the creditor banks. In this way each bank settles all its obligations to all the other banks of the city by one single payment, instead of settling with each bank separately.

History. The clearing house system was first established in London during the latter part of the eighteenth century. The New York clearing house, the most important one in the United States, was established on October 11, 1853. During its first year it transacted business of over $5,750,000,000, or an average daily business of $19,104,000. In 1915 its business amounted to over $90,842,000,000, or an average daily business of more than $302,802,000. In 1916, due to vast war contracts filled for Europe, the New York clearings were more than $250,000,000,000. The immense saving of time and labor which this method accomplishes may be seen from the fact that of this enormous amount only an average of about four per cent of the daily balances is usually paid in actual money. Next in importance to the New York clearing house is that of Chicago, where the business transacted was over $20,500,000,000 in 1916. Clearing houses have been established in all the larger, as well as in many smaller, cities of the United States. W.F.Z.

CLEAVAGE, *kleev'aj.* Careful examination of a block of loaf sugar reveals numerous glossy spots on it. When seen under a magnifying glass these glossy spots prove to be the sides of small crystals of sugar. A piece of rock salt presents a somewhat similar appearance. We know that slate and mica can each be divided into thin layers which have smooth surfaces, provided the divisions are made at the right places. The surfaces of crystals and these natural planes of division in slate, mica and other substances are the places along which such substances easily break or separate. They determine the manner of separation and the form of the different parts. This manner of separation is known as *cleavage,* and the directions along which such bodies break are called *planes of cleavage.* Iron shafts sometimes become crystallized by long usage and break along a plane of cleavage. When this occurs the surfaces of the crystals are very easily seen. See CRYSTALIZATION; METAMORPHISM.

CLEBURNE, *kle'burn,* TEX., the county seat of Johnson County, and a distributing center for the surrounding agricultural region, situated in the northeastern part of the state, about thirty-two miles south of Fort Worth, fifty-four miles southwest of Dallas and sixty miles north of Waco. Railway facilities are provided by the Gulf, Colorado & Santa Fe Railway, constructed to this point in 1883; the Missouri, Kansas & Texas Railway, extended to the city in 1904; and the Trinity & Brazos Valley Railway, built here in 1909. The city was founded in 1843, was incorporated in 1881 and named for Patrick Ronayne Cleburne, a Confederate general. The population, 10,364 in 1910, had increased to 12,820 in 1920.

Cleburne has a large trade in grain, live stock, cotton, wool and produce. There are planing mills, marble and granite works, cottonseed-oil mills, flour mills, foundries, cotton gins and a compress with a capacity of 75,000 bales per season. The shops of the Gulf, Colorado & Santa Fe and of the Trinity & Brazos Valley railways are located here. E.B.

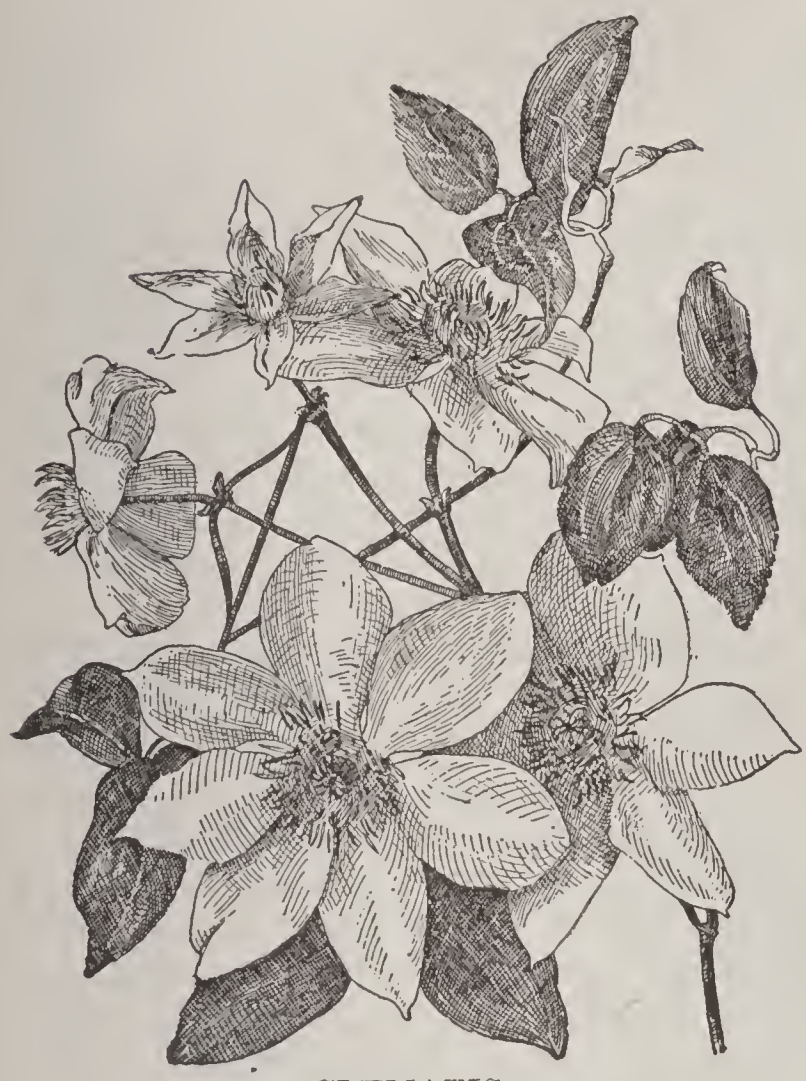
CLEMATIS, *klem'a tis,* a woody, climbing, flowering plant, found both wild and in the cultivated state throughout North America and Europe. It is beautiful in flower, but even more attractive when it is gone to seed. In September, when most of the summer flowers have come and gone—

> Then the wild clematis comes,
> With her wealth of tangled blooms,
> Reaching up and drooping low,

and we see the sprays of white or purple star-like flowers gracefully trailing over rocks and fences or swinging from the tops of shrubs. In the cities, the cultivated varieties cover veranda, trellis and arbor with fragrant white blossoms or large flowers of blue or reddish-purple. The most common variety is the *virgin's bower,* or *traveler's joy.* When its flowers have gone the vines are covered with feather-tailed, silky tufts of seed-clusters like

an "old man's beard," or like "smoky clusters" rising—

"as from fires of sacrifice,—
Sacred incense to the dead!"



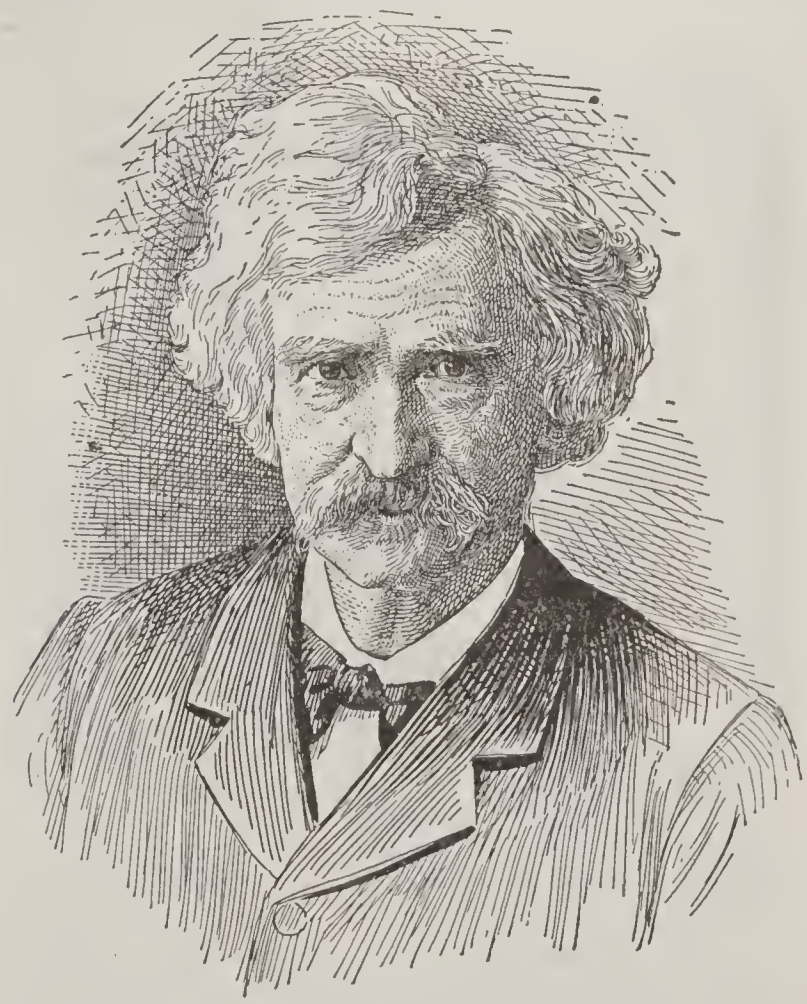
CLEMATIS

CLEMENCEAU, *kla mahn so',* GEORGES BENJAMIN EUGENE (1841-), teacher, physician, editor, statesman—the "tiger of France," the outstanding character in his country during the War of the Nations, and before that time for a third of a century a powerful influence in French affairs.

He married an American woman while in the United States in his early years. Here he taught a girls' school and practiced medicine. Returning to France in time to witness the Franco-German War and exercise a certain influence as a mayor, he swore that thereafter he should live only to avenge his country's loss of Alsace-Lorraine. He became editor of *La Justice* and of other papers; the thunder of his editorials was heard throughout Europe and led in time to a seat in the national Senate, then to the post of Premier of France. In 1909 his Ministry was defeated, but in 1917, in the darkest period of the war, he again became Premier. The fiery old man was thenceforth the inspiration of all France. At the end of the war he was presiding officer at the peace conference and head of the French delegation. In 1920 he was suggested for the Presidency of France, but was not chosen. He then retired.

CLEMENS, *klem'enz,* SAMUEL LANGHORNE (1835-1910), the most popular American humorist, whose books, written under the name of MARK TWAIN, have made him loved wherever English is spoken and have brought good-natured laughter into millions of homes. What boy does not count among his treasures *The Adventures of Tom Sawyer* and *Huckleberry Finn?* What man does not look back with real delight to the time when he first read them, and, re-reading them now, finds new sources of humor? And even the serious historian finds them of value; for they give very clear, lifelike pictures of life in a bygone day.

Clemens was born in the town of Florida, Mo., on November 30, 1835, and received only the meager education which a little western town of those days afforded. At the age of thirteen he was at work in a printing office, and there, with characteristic zeal, he soon became an expert type-setter. He worked for a time in Saint Louis, New York and Philadelphia, but the life of the river held a strong fascination for him and in 1851 he became a steamboat pilot. Every reader of his *Life on the Mississippi* has followed with keen interest his experiences while in this position. It must have been during this time that he chose his pen name, for "Mark Twain!" was a frequent call of the sounder to indicate that the water was two fathoms deep.



SAMUEL L. CLEMENS
Better known to the world as "Mark Twain."

When the War of Secession broke out navigation on the Mississippi practically ceased, and Clemens joined a company of Southern sympathizers who had volunteered in the Confederate ranks, but he saw no actual service. In Nevada, whither he went with his brother after the war, and later in San Francisco, he worked as a reporter, and readers of the papers for which he wrote had glimpses of his delightful humor, which consisted largely in treating with absolute seriousness gross exaggerations. For a time he was interested in mining, then he took a trip to the Sandwich Islands (now Hawaiian Islands), and after his return in 1866 he gradually acquired a reputation as a writer and lecturer. *The Jumping Frog of Calaveras County* and *Innocents Abroad,* the latter an account, exquisitely funny in places, of a trip through Egypt and the Holy Land, won him a more than local reputation and made him prosperous. He married in 1871, and in the same year gave up the editorship of the Buffalo *Express,* which he had held for two years, and removed to Hartford, Conn. There he lived the rest of his life, with the exception of the ten years from 1889 to 1899, which were spent in Europe. A New York publishing house in which he was interested failed in 1894, leaving him with a burden of debt, which was entirely paid off, however, by the proceeds of his 1895-1896 lecture tour around the world.

HIS BIRTHPLACE

From a photograph taken several years before his death, on the occasion of a visit "back home."

In addition to the famous works mentioned above, he wrote *A Connecticut Yankee at King Arthur's Court,* a study in contrasts between the romantic age of chivalry and the shrewd and progressive nineteenth century in New England; *Pudd'nhead Wilson,* a serious study of life in a little Missouri town, with some excellent character drawing; *The Prince and the Pauper,* a fantastic tale of what happened when Prince Edward of England changed positions with a beggar boy; *Recollections of Joan of Arc,* and other works. He wrote some things which were not intended to be funny, but the public insisted on looking for humor in everything that came from his pen. He himself was far from being the typical "funny man," but took a deep interest in serious questions, social and political, and was of a somewhat melancholy temperament. A.MC C.

Consult Howells' *My Mark Twain;* Paine's *Mark Twain: a Biography.*

CLEMENT, *klem'ent,* the name of fourteen Popes, of whom the fifth and sixth were Frenchmen and resided at Avignon. Of most importance historically were Clement I, Clement VII, Clement VIII and Clement XIV.

Clement I, commonly known as Clement of Rome, lived in the first century A. D., and is supposed to have been the third bishop of Rome after Saint Peter. The early Christians felt a reverence for him second only to that in which the twelve Apostles were held, and his *Epistle to the Corinthians* is an important source of early Church history. For a time this letter ranked as a part of the Scriptures.

Clement VII, Pope from 1523 to 1534, was of the famous Medici family (see MEDICI). His reign fell during the troubled days of the early Reformation, and his vacillating character led him to take sides with one party after another until all lost faith in him. The troops of Emperor Charles V sacked Rome in 1527; the Pope was for a time held prisoner in one of his own castles, but was later reconciled to the emperor, whom he urged to take severe measures against the Protestants. Clement's refusal to grant the divorce of Henry VIII of England from Catharine lost England to the Church of Rome (see CATHARINE OF ARAGON; HENRY VIII).

Clement VIII, Pope from 1592 to 1605, was a lover of learning, as was shown by his favors to scholars and the revisions of the Vulgate, the breviary and the liturgical books which he caused to be made; a man of sincere piety, as his daily confessions bear witness; and an apostle of peace rather than war, for he led in the mediations which resulted in the Peace of Vervins between France and

Spain. It was he, too, who reconciled the great Henry IV of France with the Church.

Clement XIV, the last of the name, was Pope from 1769 to 1774. Because of his support of the Jesuits he met with determined opposition in most of the Roman Catholic countries of Europe and finally was compelled to sign a brief suppressing the Order. He was not only a statesman of ability, but a scholar as well, and was the founder of the Clementine Museum in the Vatican. G.W.M.

CLEOPATRA, *klee o pay' tra,* the name borne by several Egyptian queens, most famous of whom was CLEOPATRA VI, daughter of Ptolemy Auletes and one of the most celebrated rulers the world has ever seen. Her beauty influenced the policies of the greatest men of her day. Blaise Pascal (1623-1662), in *Thoughts,* said, "If the nose of Cleopatra had been shorter, the whole face of the earth would have been changed."

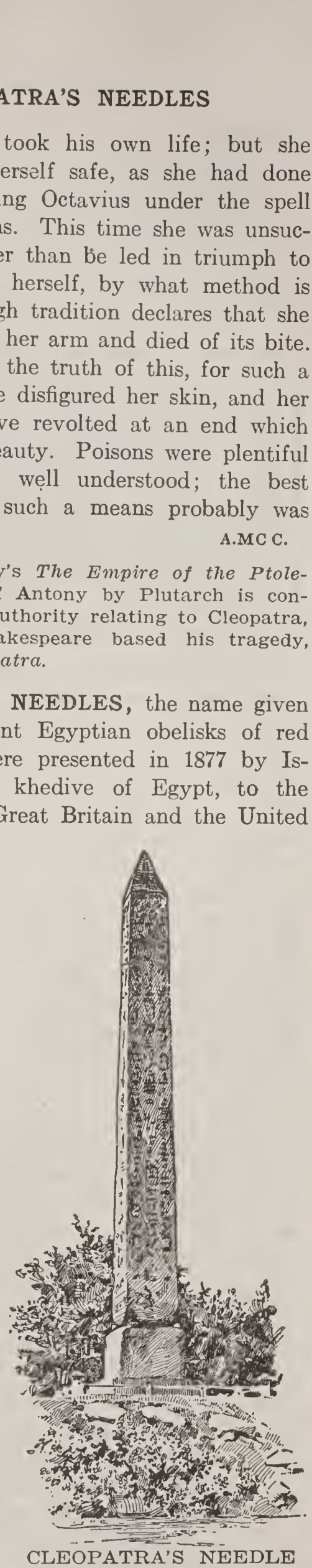
She was born in 69 or 68 B. C., and in 51 B. C. came to the throne on the death of her father. Her brother, Ptolemy, then twelve years old, was made joint ruler with her, and his advisers soon succeeded in seizing all the power and driving Cleopatra from the kingdom. She collected an army in Syria, but met with no success until Caesar, visiting Alexandria and falling a victim to her personal charms, took up her battles for her. Her brother was defeated and killed, and a younger brother, also called Ptolemy, was placed on the throne with her. In 46 B. C. Cleopatra went to Rome, and she remained there as Caesar's mistress until his death in 44 B. C.

On her return to Egypt she had her brother put to death that her son by Caesar, Caesarion, might become her heir. In 42 B. C., after the Battle of Philippi, she had her momentous first meeting with Mark Antony at Tarsus. She had arrayed herself for conquest, and Antony promptly fell in love with her and followed her back to Egypt. There he lived for some time, and although obliged to return to Rome, he hastened back to Alexandria as soon as possible and gave himself up to pleasure and revelry with her. He divorced his wife Octavia, sister of Octavius, for her, and thus hastened the war with Octavius which culminated in the Battle of Actium.

Cleopatra had brought her fleet to aid Antony, but believing that he was being defeated she fled with her ships, and Antony followed her. She let the report reach him, on the approach of Octavius, that she had committed suicide, and he took his own life; but she tried to make herself safe, as she had done before, by bringing Octavius under the spell of her fascinations. This time she was unsuccessful, and rather than be led in triumph to Rome she killed herself, by what method is not known, though tradition declares that she placed an asp on her arm and died of its bite. Historians doubt the truth of this, for such a death would have disfigured her skin, and her vanity would have revolted at an end which could mar her beauty. Poisons were plentiful and their effects well understood; the best opinion declares such a means probably was employed. A.MC C.

Consult Mahaffy's *The Empire of the Ptolemies.* The life of Antony by Plutarch is considered the best authority relating to Cleopatra, and on this Shakespeare based his tragedy, *Antony and Cleopatra.*

CLEOPATRA'S NEEDLES, the name given to two magnificent Egyptian obelisks of red syenite which were presented in 1877 by Ismail Pasha, the khedive of Egypt, to the governments of Great Britain and the United States, respectively. One was set up on the London embankment in 1878; the other stands in Central Park, New York, having been transported to the United States in 1880. The latter is sixty-nine feet high and seven and one-half feet thick at the base, and weighs 200 tons. It rests on four bronze bases, the originals of which are in the Metropolitan Museum of Art, a few rods to the east. The sides of the obelisk are covered with hieroglyphics and bear inscriptions of Thothmes III (about 1500 B. C.) and Rameses II. These obelisks originally stood before the temple of the Sun



CLEOPATRA'S NEEDLE
In Central Park, New York City.

at Heliopolis, whence they were removed to Alexandria in 14 B. C.

Restoring the Obelisk. Although the obelisk had stood undamaged in the dry climate of Egypt for more than 3,000 years, the moist salt air of New York has damaged its surface. Efforts were made with some success years ago to protect it, but now many of the hieroglyphics have been destroyed. Professor Kukro of the Metropolitan Museum has invented a preservative which it is thought will be effective; this will be applied after the inscriptions have been restored from photographs which had been taken of them.

CLEVELAND, [STEPHEN] GROVER (1837-1908), the twenty-second and twenty-fourth President of the United States, the first Democrat after the War of Secession to hold this office and the only President who has served two terms not in succession. Probably no other President was more consistent, more courageous in his convictions, and for a time more unpopular. Cleveland was physically large and heavy, and like many men of his build was calm and deliberate in his judgments, but once his mind was made up he was not swayed by public clamor. He was obstinate, though never merely for the sake of being obstinate, but always for reasons of conscience.

Yet it must not be imagined that Cleveland could not feel the public pulse. He may have been indifferent, but he was not deaf to public opinion. And there were times when he presented an issue to the public in such a form that his words are still quoted. He was not an orator, but he could phrase his statements in crisp, telling form. When he said that "Public office is a public trust," everybody understood him.

His Youth. Cleveland was born on March 18, 1837, at Caldwell, Essex County, N. J., where his father was pastor of the Presbyterian church. The son was christened Stephen Grover, but dropped the name Stephen before he reached manhood. After 1841 the family lived first at Fayetteville, N. Y., and later at Clinton, N. Y. Grover was sixteen years old and was preparing to enter Hamilton College, when his father died. He went to work to help support his mother and sisters, and for a year taught in the Institution for the Blind at Batavia. He then felt, however, that the West offered him greater opportunities, and in the autumn of 1855 he borrowed twenty-five dollars and set out for Cleveland, Ohio. He got no farther than Buffalo, where an uncle persuaded him to remain and soon found him a position as clerk in a law office.

GROVER CLEVELAND
From a photograph taken the year before his death.

In Law and Politics. Almost immediately after his admission to the bar in 1859, Cleveland became conspicuous in local politics, and in 1863 was appointed assistant district attorney for Erie County, of which Buffalo is the

chief city. Two years later he was the unsuccessful candidate for district attorney, but in 1870 he was elected sheriff. In this office, which he held for three years, he displayed at least one trait which was characteristic of him throughout his career. Because he believed that a public official should perform the duties for which he was elected, he personally sprung the trap that hanged a convicted criminal rather than delegate this duty to a deputy. At the end of his term he resumed the practice of law, and was soon recognized as one of the leaders of the bar in Western New York.

The decade following the War of Secession was a period of political corruption and confusion, and of extravagance in public and private life. Cleveland's appearance in public life nearly coincided with the beginning of a reaction against the looseness of morals which had been apparent during these years. Cleveland as sheriff had displayed an honesty and devotion to duty which led to his nomination and election in November, 1881, as mayor of Buffalo on a reform ticket. In a year Buffalo experienced little less than a revolution, for its mayor was a man who went on his course without regard to "influence." A year in the mayor's office won him the Democratic nomination for governor of New York. His opponent was Charles J. Folger, President Arthur's Secretary of the Treasury, a man of great ability but unfortunate in that the people of New York thought he was being forced upon them by "machine" politics. Cleveland was elected by a plurality of 192,800 votes—an unprecedented number. As governor Cleveland continued to show the same fearless independence which had characterized his course as mayor of Buffalo. He kept a watchful eye on many details of administration which governors usually neglect. It is said that he never signed a bill until he had read it through; he accepted nobody's interpretation of it, but always relied on his own judgment. He vetoed so many bills that he was often called the "veto governor." He offended Tammany, the labor element and many others. Nothing better showed his disregard of public clamor than his veto of a bill which provided lower rates of fare on the elevated railroads of New York City. The object of the bill met his approval, but not the method. Nevertheless, he won a large personal following, simply because he was fearless and independent.

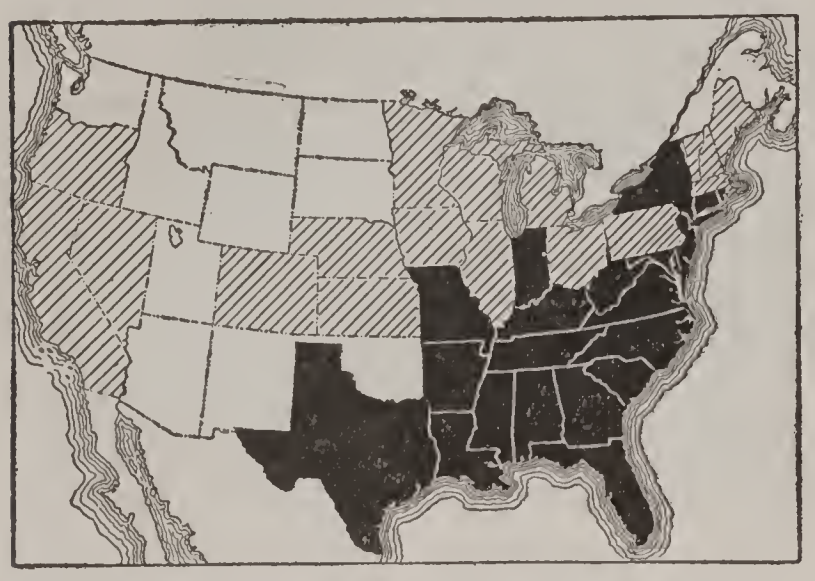
Cleveland's Career as President

The Election of 1884. Cleveland's terms as mayor of Buffalo and governor of New York made him a national figure. As the time for the campaign of 1884 approached, he was recognized as the leading candidate for the Democratic nomination, and at the national convention in Chicago was nominated practically without opposition. The Republicans nominated James G. Blaine, one of the most brilliant men in public life and one of the most popular. Yet Blaine had many enemies, and thousands of Republicans refused to vote for him. It was this element, called *Mugwumps* (which see), who turned against Blaine and elected Cleveland. The campaign was one of the bitterest in the history of the United States. Blaine attempted to keep alive the issues of the War of Secession and reconstruction, but the campaign proved that they were dead. The real contest was personal, and was marked by charges against the characters of both Cleveland and Blaine. When friends of Cleveland asked him how they should answer the charges against him he said, "Tell the truth!" The election was close; the result was not known for three days, until the official count gave Cleveland a plurality of fewer than 1,500 votes in New York state. New York's vote gave Cleveland a plurality of thirty-seven in the electoral college. Cleveland's popular vote was 4,912,696, against 4,849,680 for Blaine.

First Administration (1885-1889). His term of office was in many respects notable. It was apparent from the first that Cleveland was prepared to take, and even insisted on taking, the entire responsibility of the administration. He showed his independence at the start by refusing to make wholesale removals of Republican office-holders. Although he made enough changes to incur the disapproval of reformers, his administration marked a great advance in civil service. He applied the principles of the Civil Service Act of 1883 to many offices not specifically mentioned in the act; and during his term in office added nearly 12,000 officers to the classified service.

Vigorous Use of the Executive Power. During his term Cleveland frequently proved his independence. He became involved in a quarrel with the Senate, in which the Republicans were in the majority, because he refused to

give his reasons for removing certain officers. The Senate's consent was necessary to their appointment, but when the Senate demanded that the President make public the documents on which he based their removal he laid down the principle that a President's papers were not subject to the order of Congress. In other



ELECTION OF 1884

States shown in black were Democratic; cross-lined, Republican; white, non-voting territories.

ways he maintained the dignity of the Chief Magistrate. He prevented a rebellion among the Mormons by concentrating troops at Salt Lake City. In a dispute over Canadian fisheries he threatened to prohibit importation from Canada except over American-owned railways, and he dispatched 3,000 marines to the Isthmus of Panama to quell an insurrection which threatened loss of American lives and property. During his term he vetoed over 400 bills sent to him by Congress. Nearly two-thirds of these were private pension bills, but the most important of all the vetoed bills was the Dependent Pension Bill, whose indefinite terms would have opened the way to endless confusion. Cleveland's frequent use of the veto power gave him the nickname of the "Veto President."

Labor Troubles. During the whole of this period the United States was disturbed by labor troubles. There were many strikes in different parts of the country, and relations between labor and capital were generally unsatisfactory. The Knights of Labor, an organization founded in 1869 on the principle that "the injury of one is the concern of all," increased its membership from about 100,000 in 1885 to more than 700,000 in 1886. The number of strikes in 1886 was more than double the number in 1885. In one of the strikes, affecting the Gould system of railways, 6,000 miles of railway were tied up, and a great strike at the McCormick harvester plants in Chicago had its climax in the famous Haymarket Riot (see CHICAGO, subhead *History*). President Cleveland, in a message to Congress, advocated an arbitration commission to settle industrial disputes, but Congress took no action.

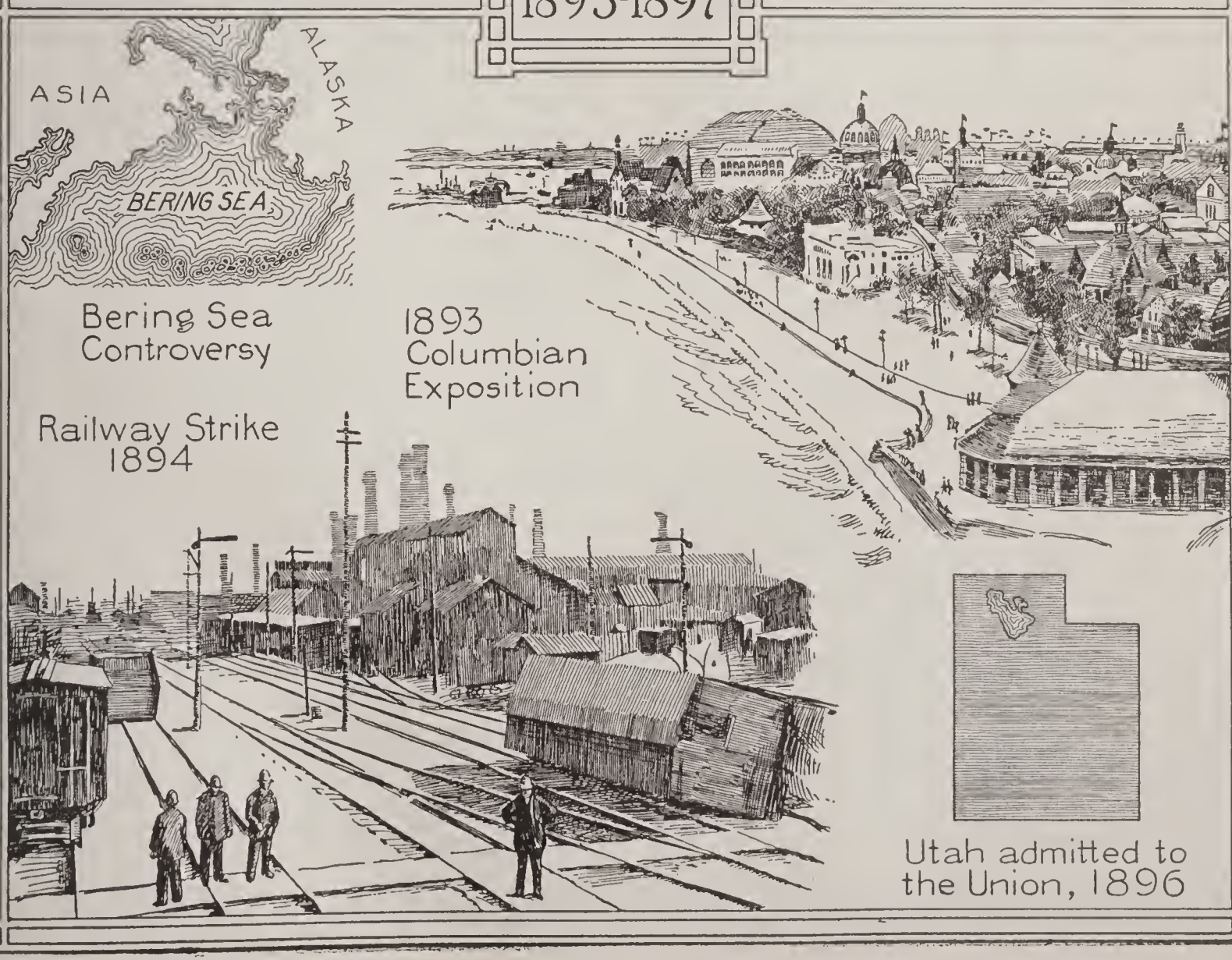
Important Legislation. Although the Democrats in the Senate of the United States during the whole of his term were in the minority, Cleveland's administration was noteworthy for the enactment of a number of important laws. First of these was a contract labor law, prohibiting the importation of alien laborers under contract. Other important acts were the Presidential Succession Act (which see) of 1886; a new Anti-Polygamy law, in 1887, dissolving the Mormon Church as a corporation and confiscating all its property over $50,000 in each case; the Electoral Count Act of 1887, which made the states the final judges in controversies concerning the election of Presidential electors, and thus was aimed to prevent disputes like that of 1876; and the Chinese Exclusion Act, in 1888, which forbade further Chinese immigration. More important than any of these was the Interstate Commerce Act of 1887 (which see), placing the railway and other common carriers under the control of a Federal commission. During the last months of Cleveland's administration Congress voted to establish a Department of Agriculture, and also passed an enabling act for the admission of North Dakota, South Dakota, Montana and Washington to the Union.

Local and Miscellaneous Events. One of the most interesting events of these years was the dedication of the Statue of Liberty in New York Harbor, in 1886. The New Orleans Cotton Exposition in 1885 and the destruction of Charleston, S. C., by an earthquake in 1886 are also noteworthy.

The election of Cleveland in 1884 showed that the old political issues raised by the War of Secession were dead. As if to bear witness to this fact, during Cleveland's term occurred the deaths of many of the men who had been leaders during or immediately after the war. Among these famous men were U. S. Grant, George B. McClellan, Philip H. Sheridan, John A. Logan, Winfield S. Hancock, Samuel J. Tilden, Horatio Seymour, Roscoe Conkling, and Cleveland's predecessor in the Presidency, Chester A. Arthur.

The Tariff and the Presidential Election of 1888. For a number of years the United States government had faced the problem of an increasing surplus in the treasury. During

ADMINISTRATIONS OF CLEVELAND



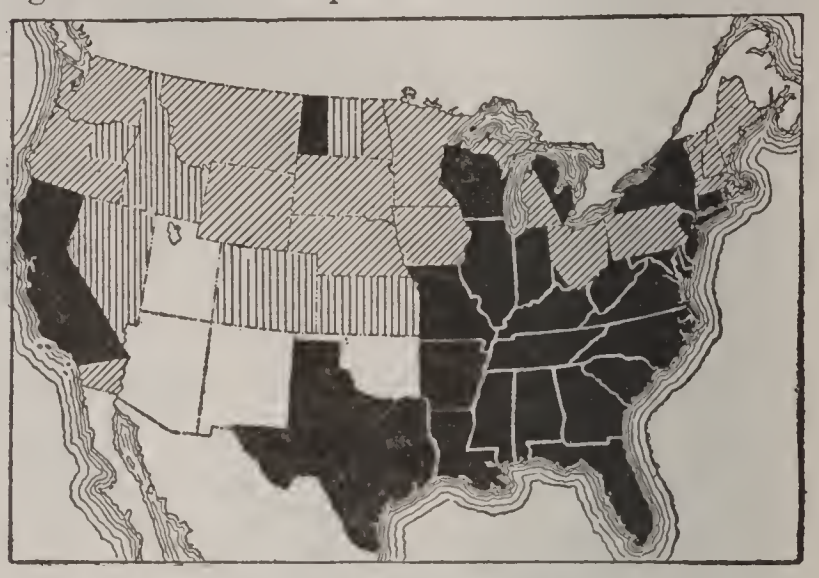
Arthur's administration several attempts were made to reduce the surplus by appropriations, many of which were wasteful. In a special message to Congress in December, 1887, Cleveland pointed out that the increasing surplus showed that the scale of taxation was excessive, and recommended sweeping reductions in the import tariffs. The Mills Bill, which passed the House of Representatives, was a low-tariff measure, estimated to reduce the revenues by $50,000,000 a year. The Republican Senate amended it so that it became a high protective measure, which the House refused to accept.

The failure of this tariff bill, however, placed the issue squarely before the country in a Presidential election year. The tariff was the chief issue in the campaign. Cleveland was renominated, and to oppose him the Republicans chose Benjamin Harrison of Indiana. Cleveland received a plurality of 96,000 in the popular vote, but Harrison carried New York and thus had a majority in the electoral college (233 to 168) and was elected.

An Interval in Private Life. In 1886 Cleveland married, at the Executive Mansion, Miss Frances Folsom, the daughter of a former law partner in Buffalo. At the end of his term he moved to New York City and there practiced law. When he went out of office his political career seemed ended, but by 1892 the McKinley tariff law (see TARIFF) and other Republican measures led to a change in public feeling. In spite of the opposition of the Democratic leaders of New York, his own state, he was again nominated for President and was reëlected over Harrison by an electoral college vote of 277 to 145, and a plurality of 364,000. At this election, for the first time since the election of 1860, more than two candidates received electoral votes. General James B. Weaver of Iowa, a Populist, received twenty-two votes.

Second Administration (1893-1897). Cleveland's second administration was one of the most remarkable in the history of the United States. He entered office free from pledges; the office had sought him. Naturally independent and sometimes lacking in tact, he now paid little attention to the feelings of other men, and probably no other President ever did things more unpopular at the time. For the first time since Buchanan's administration the Democratic party was in control in the White House and in both houses of Congress. But at the outset Cleveland antagonized a large section of his party by his stand on the silver issue. In the summer of 1893 the country suffered from a severe panic, and the government's gold reserve fell far below the danger point. The United States was actually, though not knowingly, on the verge of inability to redeem its notes in specie.

Cleveland faced the issue squarely, called Congress in special session, and after a bitter fight forced the repeal of the Sherman Silver



ELECTION OF 1892

States shown in black were Democratic; oblique shaded, Republican; perpendicular shaded, Populist; white, non-voting territories.

Purchase Act of 1890. That act, by requiring the government to buy a large amount of silver each month, was exhausting the gold reserve. Cleveland, through Secretary of the Treasury Carlisle, sold for gold several bond issues to a syndicate of New York bankers, in order to keep the gold reserve at a point where it was enough to redeem the government's paper currency. He was severely criticised for allowing the bankers a large profit, and a later bond issue was sold by public subscription. The effects of the panic, however, were apparent for several years, until about 1897.

One of the principal results of the business depression following the panic was a series of labor troubles which culminated in a great railway strike in 1894. Everywhere there was discontent among the laboring classes, thousands were out of work and strikes were frequent. The closing of the Pullman Company's shops at Pullman, Ill., led to a general strike of the railway employees on practically all of the lines running east of Chicago. Chicago was the center of the trouble, and rioting and destruction of property were ordinary events of the day. As the governor of Illinois, John P. Altgeld, refused to call out the militia to preserve order, the President on his own initiative sent Federal troops to Chicago to protect the mails and incidentally to suppress rioting. This action caused a sharp controversy, because

OUTLINE AND QUESTIONS ON GROVER CLEVELAND

Outline

I. Years of Preparation

(1) Birth and parentage
(2) Education
(3) Removal to the West
(4) Practice of law

II. Early Political Career

(1) As sheriff
  (a) Serious conception of his duties
(2) As mayor of Buffalo
  (a) Financial reform
(3) As governor of New York
  (a) The veto governor
(4) The election of 1884

III. First Administration

(1) The Cabinet
(2) Legislation
  (a) Contract labor law
  (b) Presidential Succession Act, 1886
  (c) Anti-Polygamy law, 1887
  (d) Electoral Count Act, 1887
  (e) Chinese Exclusion Act, 1888
  (f) Interstate Commerce Act, 1887
(3) Other governmental affairs
  (a) Advance in civil service
  (b) Controversy between President and Senate
  (c) Troops sent to Salt Lake City
  (d) Marines sent to Panama
  (e) States admitted
(4) Miscellaneous events
  (a) Haymarket Riot in Chicago
  (b) Other labor troubles
  (c) Arrival of Statue of Liberty
  (d) New Orleans Cotton Exposition
  (e) Destruction of Charleston
(5) Election of 1888

IV. Second Administration

(1) Election of 1892
(2) Legislation
  (a) Sherman Silver Purchase Act repealed
  (b) Tariff revision
(3) Foreign affairs
  (a) Hawaiian annexation treaty withdrawn
  (b) Treaty with China
  (c) Venezuela message
(4) Other events
  (a) Financial panic
  (b) Labor troubles
    1. Troops sent to Chicago
  (c) World's Columbian Exposition
  (d) Utah admitted

V. Summary

(1) Later life
(2) Character

Questions

What words, spoken shortly before his death, summed up his aim in life?

How did Cleveland manage to displease both the civil-service reformers and the "spoils system" advocates?

What led to his nomination in 1892?

What significance had the fact that he once sprung the trap and hanged a criminal in showing his attitude toward public office?

What was the most important legislation of his first Presidential term?

How many Presidents have served two terms not consecutively?

What was the Sherman Silver Purchase Act, and why was it repealed?

What were "Mugwumps," and what part did they have in determining the career of Cleveland?

How did the public attitude toward Cleveland at his death differ from the attitude toward him when he went out of office?

What is regarded as his greatest act?

Why did not Cleveland fight in the War of Secession? What did he do instead?

What was the Haymarket Riot?

How did the President incur the enmity of a governor of Illinois?

Altgeld insisted that the President had no right to order out Federal troops for service in a state except at the request of the governor.

In the midst of the panic and depression Cleveland urged a revision of the tariff in accordance with the Democratic campaign promises. The Wilson Bill, framed in the House according to the President's suggestion, was so materially altered in the Senate that Cleveland refused to sign it. He allowed it to become a law (1894) without his signature, but issued a statement criticising some of the Democratic Senators who had not supported their party. This split in the Democracy was followed by Republican victories at the polls in November, 1894, and for the last two years of his term the new Republican majority prevented Cleveland from securing any important legislation.

In his foreign policy Cleveland was no less energetic and firm than at home. Almost his first act in 1893 was to withdraw from the Senate the Hawaiian annexation treaty negotiated in Harrison's administration. He secured a treaty with China which marked the beginning of the "open door" policy. But perhaps his greatest act, which has left the deepest impress on American history, was his famous Venezuela message, sent to Congress on December 17, 1895. Cleveland's Secretary of State, Richard Olney, had urged Great Britain to arbitrate its dispute with Venezuela over the British Guiana-Venezuela boundary, but Great Britain insisted that the Monroe Doctrine did not apply to the issue. Thereupon Cleveland sent a brief message, in which he declared that the Monroe Doctrine was the vital issue at stake, and intimated that the United States would go to war to maintain it. The excitement in Great Britain and the United States grew intense, but after several diplomatic exchanges the English government agreed to arbitrate the boundary dispute; this was accomplished to the satisfaction of all concerned.

The Private Citizen

The Venezuela message was Cleveland's last important act as President. When he retired to private life in 1897 there was probably no more unpopular man in the United States. He had offended his own party by his stand on the silver and tariff issues; he had won the enmity of labor by his action during the strike; he was even disliked by the bankers and financiers

CLEVELAND MEMORIAL TOWER
At Princeton University.

because his Venezuela message had upset the stock markets. Yet Cleveland was fortunate enough to outlive the bitterness of these years, and long before his death he was universally respected and recognized as one of the greatest of the Presidents. The policies for which he had fought and had been jeered at were carried out by his Republican successors, and even his few mistakes were excused in the light of his undoubted honesty of purpose. From 1897 until his death he made his home in Princeton, N. J., where he took an active interest in the university, especially the graduate school. He was a lecturer and a trustee of the university for ten years, and the beautiful tower of the graduate school is a memorial to him.

In 1895, following the exposure of insurance scandals in New York, Cleveland became one of the trustees of the Equitable Life Assurance Society, one of the largest insurance companies in the United States. Nothing is better testimony to Cleveland's reputation than the renewal of public confidence in this and other companies after he assumed this responsibility. The hero of Paul Leicester Ford's *The Honorable Peter Stirling* is in part a characterization of Grover Cleveland. A.B.H.

Other Items of Interest. A Republican of high standing, who opposed Cleveland in many ways, declared that his treatment of the Venezuela question was "the most signal victory of American diplomacy in modern times."

During his second Presidential candidacy Cleveland was referred to by his opponents as "The Perpetual Candidate" and "The Stuffed Prophet."

The lectures delivered during his later years at Princeton University were published as *Presidential Problems.*

Cleveland could not enlist during the War of Secession, for two of his brothers were in the army and he had to work hard to support his mother and sisters. But he borrowed money to hire a substitute, and was unable to repay the loan until long after the war was over.

The Indians of the Oklahoma country had been deprived of many of their rights and much of their territory by white settlers, but Cleveland compelled the latter to withdraw and even to tear down the fences which they had built on their "claims."

At the great memorial meeting which was held for Cleveland, his personal friend, Richard Watson Gilder, read a poetic eulogy, in which occurred the following lines, which give a true picture of the man:

Thou brave and faithful servant of the State,
Who labored day and night in little things,
No less than large, for the loved country's sake,
With patient hand that plodded while others slept!

Fishing was Cleveland's favorite relaxation, and at this sport, as in everything else, the secret of his luck was "hard work and no let up." No sun was hot enough, no storm blinding enough to turn him from his favorite pastime, and that he took the matter seriously is shown by the fact that he published a volume of *Fishing and Hunting Sketches.*

Cleveland was one of the few men who have been much in public life of whom it may truthfully be said that in no instance did he seek the office—the office always sought him.

His manner of speaking was delightfully informal, and his powers of mimicry were so great that Joseph Jefferson declared that he had missed his calling and should have been an actor.

Almost the last words he spoke were, "I have tried so hard to do right."

Consult Peck's *American Party Leaders;* Stanwood's *History of the Presidency;* Whittle's *Grover Cleveland.*

CLEVELAND, Ohio, the largest city of the state, the second largest port on the Great Lakes and the fifth city in the United States in population. It is the county seat of Cuyahoga County and the most important manufacturing and commercial center of Ohio. Cleveland is situated on Lake Erie, at the mouth of the Cuyahoga River, in about the center of the coast border of the state, 96 miles east and south of Toledo, 132 miles northwest of Pittsburgh, 183 miles southwest of Buffalo and 245 miles northeast of Cincinnati. Chicago is 339 miles west. Cleveland is an important railway center, being served by the Baltimore & Ohio; Cleveland, Cincinnati, Chicago & Saint Louis; Erie; New York Central; New York, Chicago & Saint Louis; the Pennsylvania, and the Wheeling & Lake Erie railroads.

Interurban lines extend to Ashtabula on the east, to Columbus and Youngstown on the south and to Toledo on the west. Steamers docking at Cleveland connect with all ports on the Great Lakes from Duluth to Buffalo, and through the Welland Canal with Toronto and the Saint Lawrence River. The area of the city exceeds fifty-one and a half square miles. In 1920 its inhabitants numbered 796,836; by the Federal census of 1910 the population was 560,663. About thirty-five per cent is made up of Germans, Austrians, Hungarians, Russians, Irish and Italians.

Cleveland is located 689 feet above sea level, on a plateau which slopes gently toward the lake, and is divided by the winding course of the Cuyahoga River into a smaller western section (West Cleveland) and an eastern, or principal, section. It is also intersected by two tributaries of the stream. Near the river bank, where the land is low and flat, are located many of the industrial works. Several viaducts span the river and connect the various levels of the city, the most remarkable of these being two constructed of steel and iron, which

are ranked with the finest structures of their kind in the United States. One is 3,931 feet long; the other, 3,211 feet, and known as the Superior Avenue Viaduct, was built at a cost of $2,250,000, but is to be replaced by a bridge affording mast clearance for the largest vessels. The second largest concrete bridge in the world in 1917 spans the Rocky River on the outskirts of the city.

Parks and Boulevards. Cleveland is known for its broad, regular, well-paved streets and boulevards, ranging from forty to 132 feet in width. The abundant growths of trees and shrubbery which beautify the streets, together

METROPOLITAN DISTRICT

1. Rocky River
2. Rockport (Lakewood City)
3. West Park (Rockport Village)
4. Brooklyn
5. Brooklyn Heights
6. Newburgh Heights
7. Newburgh
8. Cleveland Heights
9. East Cleveland
10. Euclid
11. Bratenahl

with the many parks of the city, have acquired for it the popular name of the *Forest City*. Euclid Avenue, varying in width from eighty-three to ninety feet, and extending from the southeast end of the Public Square, through Lakeview Cemetery and the suburbs of East Cleveland, is one of the notable streets in the world. Fine residences, built several hundred feet from the street and surrounded by spacious grounds, line this avenue on both sides. Its beauty, however, with that of a number of other streets, has been somewhat marred in recent years by the expansion of the business district. Lake Shore and East boulevards, Magnolia Drive, Bellflower Road, Juniper Drive and Clifton Boulevard are all attractive streets. The Public Square is the heart of the business district and the center of the street railway lines; from it the streets radiate in all directions. This square was formerly a park; two broad streets, crossing at right angles, now divide it into four sections.

The many parks of the city cover 2,673 acres, and the system is one of the finest in the United States. At the mouth of Doan Brook, which flows into the lake, lies Gordon Park (122 acres); Wade Park, overlooking the lake, has magnificent trees, a zoölogical garden and monuments to Commodore Perry, hero of the Battle of Lake Erie, and to Goethe and Schiller. The entire valley of Doan Brook, presented to the city by John D. Rockefeller and others, was converted into a narrow park, about four miles long, and like a ribbon it connects Wade and Gordon parks. Newberry, Forest City, Brookside, Woodland Hills, Lincoln and Garfield parks are among the other recreation grounds and amusement resorts of the city.

Lakeview Cemetery, six miles to the northeast, is a beautiful burial place, occupying an eminence on the crest of which stands the Garfield Memorial, 165 feet high and constructed of Ohio sandstone; the balcony around the top affords a view of the lake and surrounding country, and the chapel below contains panels and reliefs of various episodes in the life of the former President. Though Cleveland is an industrial and commercial city, the absence of large tenements and congested population is distinctly noticeable. It is a city of homes, a fact suggested by the prevalence of detached houses with gardens. In 1910 there were 90,465 dwellings. Through the children of the schools the Home Gardening Association has done much to beautify the city.

Buildings. According to a plan worked out by a committee of architects, including Daniel H. Burnham, the public buildings are being arranged in a group on a plot of ground in the center of the city. In addition to the Federal building, the courthouse and the city hall, already completed, the buildings of the group will ultimately include a union passenger station, the public library building and the museum. These structures are to be of imposing architectural beauty, and the group when finished will have cost $35,000,000. The Chamber of Commerce, the Art Museum, Central Armory, Cleveland Grays' Armory, Western Reserve Historical Society Building and the buildings of the Brotherhood of Locomotive Engineers, Guardian Savings and Trust Company, Central National Bank, First National Bank, Citizens' Savings and Trust Company and Union National Bank are all structures of substantial appearance and architectural beauty. One of the Federal Reserve banks is located here.

Cleveland has ample facilities for entertaining transients. The Statler, Hollenden, Cuyahoga, Euclid, Colonial, New Amsterdam and Gillsy hotels have modern equipment. Noted among the office buildings are the Euclid, Colonial, Taylor and Superior arcades, of which the last named, with several tiers of stores and offices arranged on both sides of a central court, is the largest. Among the prominent religious structures are the Roman Catholic Cathedral, Saint Michael's, Saint Prokop's, the Euclid Avenue Synagogue, Pilgrim and Euclid

GARFIELD MEMORIAL
In Lakeview Cemetery.

Avenue (Congregational), Trinity and Saint Paul's (Protestant Episcopal), First Methodist Episcopal, Epworth Memorial, Calvary Presbyterian, East End Baptist and Euclid Avenue Christian churches. The city has 389 places of worship, appealing to all denominations.

Institutions. Cleveland has numerous public, technical, business, private and parochial schools. It was one of the first cities of the United States to establish a free high school. For those desiring more advanced learning there are the University School, the Laurel and the Hathaway-Brown schools and the Ursuline Academy, but the chief seat of higher education is Western Reserve University (which see), with its departments of Adelbert College, Women's College and schools of medicine, law, dentistry, pharmacy, journalism and domestic science. There are also Saint Mary's Theological Seminary, Baldwin University, Cleveland College of Law, Cleveland Pulte Medical College and other schools of medicine, law and surgery. The public library contains 350,000 volumes, that of the Western Reserve University has 45,000 volumes, and there are medical, law and historical libraries. Among the benevolent institutions the Goodrich House, a settlement with an $80,000 building, is of the most recent organization. There are Roman Catholic, Protestant and Jewish orphanages, homes and hospitals, and harbors for the insane and other unfortunates. The Boys' Farm, twenty-two miles from the city, is controlled by the city and has a powerful influence for good among the unmanageable boys sent from the Juvenile Court. A commendable organization in connection with the public schools is the Mouth Hygiene Association, which has for its object the correction of general mouth disorders.

Commerce and Industry. Through the Cuyahoga River the Ohio Canal connects the Ohio River with Lake Erie, and affords Cleveland commercial advantages greater than those of any other city on this lake. To the sheltered harbor provided by the mouth of the Cuyahoga River has been added a ship-channel, and further safety is secured by a breakwater two miles long, one-half mile from the shore. The lake traffic is very large. Cleveland is the nearest large lake port to the great iron, coal and petroleum region of Western Pennsylvania and Northern Ohio, and has close connection with the iron and copper-ore district of Lake Superior. It is therefore the natural meeting place for these products, which explains why the city leads all others in the United States in the production of steel ships, wire, wire nails, bolts, nuts, heavy and light machinery, and a great number of kindred industries. It ranks first among the manufacturing cities of the state, second among those of the Great Lakes and fifth among those of the United States.

The city is the greatest fresh-water fish market in the country, one of the most important for grain, lumber and petroleum, and is the center of the malleable-iron trade. In the manufacture of women's outer garments it is second only to New York, and it has a high rank as a manufacturing center for gasoline and electric-motor vehicles. The variety of

its manufactures is almost endless, ranging from heavy castings and forgings to optical and astronomical instruments. Formerly Cleveland led in the construction of wooden vessels for lake traffic, and though material for this purpose has changed from wood to iron, it still holds its rank, as no other city in the United States surpasses it in the number of steel vessels produced. Among the industries dependent upon the agricultural resources of the district, that of slaughtering and meat packing is most important, and the manufacture of malt liquors is also considerable, though decreasing. One of the principal refining plants of the Standard Oil Company is located here.

History. In 1796 Moses Cleaveland, with a party of surveyors from Connecticut, went into the wilderness known as the Western Reserve (which see) to investigate the possibilities of the tract of land which had been purchased by the government. A settlement was made at the mouth of the Cuyahoga River and named Cleaveland, for its founder, the original spelling of the name alternating with the present form until 1831, when it was definitely changed by a printer because the correct spelling would not fit the headline space. In 1800 Trumbull County was organized, and Cleveland became the county seat in 1809. The village of Cleveland in Cuyahoga County, a subdivision of Trumbull County, was incorporated in 1814, when it had a population of less than 100. In 1816 the first bank was established, and in 1818 the first newspaper was issued and named the *Cleveland Gazette and Commercial Register*. By 1820 the population had increased to 600.

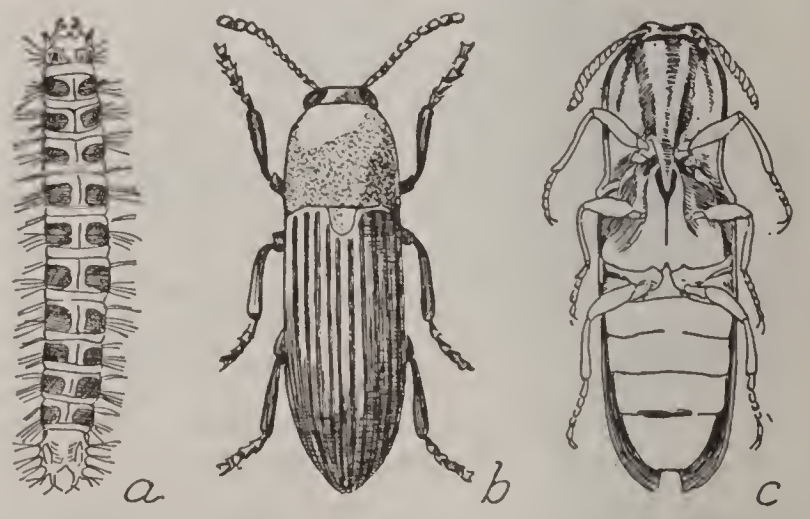
STATUE OF MOSES CLEAVELAND
Founder of the city.

The Ohio Canal was commenced in 1827 and five years later was opened as far as Akron; then the real development of the city began. The population grew from 600 to 6,000 between 1825 and 1835, and in 1836 a city charter was granted. Railway connections with the city were made in 1851, and Ohio City was annexed in 1853. Between 1872 and 1912 the following towns were annexed, in the order named: East Cleveland, Newburg, West Cleveland, Brooklyn, Glenville, South Brooklyn, Collinwood, Nottingham and Newburgh City. Cleveland has been the home of many distinguished men, including James A. Garfield, a President of the United States; John Hay, Secretary of State during the McKinley administration; Tom L. Johnson, a local capitalist and politician of national reputation, the father of the three-cent street-car fare and mayor of Cleveland for several terms; and of Marcus A. Hanna, once United States Senator and a prominent national figure. In Cleveland John D. Rockefeller, oil king and philanthropist, laid the foundations of his fortune, and his magnificent estate is an interesting feature of the city.

W.E.T.

An outline suitable for Cleveland will be found with the article CITY.

CLICK BEETLE, SPRINGING BEETLE, or **SKIPJACK,** names given to a family of springing, snapping beetles. If the click beetle is touched or alarmed, it falls to the ground, folds up its legs, and lies for a time as if dead. If upon its back, it will throw itself some little distance into the air by a sudden jerking motion accompanied by a clicking sound, and, landing on its feet, will run away. There are about 350 species of click beetles in the United States and Canada alone. Most of them are brownish; some are black, grayish or marked with gay colors.



THE CLICK BEETLE
(*a*) Wireworm, the larva stage; (*b*) adult form, from above; (*c*) from below, showing snapping apparatus.

Click beetles usually live singly, in flowers, grass and decaying wood. The destructive larvae (young) are known as *wireworms* (*a* in

illustration). They are long, slender, horny-skinned, brownish- or yellowish-white. They live on seeds and roots and do much damage. Where they appear in large numbers, plowing in August and cross-plowing in September will kill a large proportion of them. In gardens, clover or weeds poisoned with Paris green and placed in the spring season where the beetle finds shelter will destroy the pest. Some of the tropical click beetles are luminous, and one species carries two glowing spots on each side of its thorax. In Cuba the dead bodies of these beetles are sometimes worn as ornaments.

CLIFF DWELLERS, an early American race whose history can be gathered only from the ruins of their strange dwellings built in canyon cliffs and rocks. Nobody knows when they lived, or exactly what great page of human history they filled. They were gone long before the white man first saw America, and of them the Indians knew nothing more than their ruins disclose to-day. From all evidence that can be gathered it is believed the Pueblo Indians descended from them, but this is not certain. Reading their story from unearthed bodies, from bits of pottery, articles of wearing apparel and implements obtained from those almost inaccessible fortress-homes, there is unfolded a tale of absorbing interest. In the corners of Utah, Arizona, New Mexico and Colorado, which meet beyond the southern Rocky Mountains, lived this race of people, peace-loving but forced by warring tribes to live in the inaccessible cliffs, where their dwellings were strong as fortresses.

From excavations in one place in Arizona were recovered about 300 skeletons, some completely dressed, showing that the cliff dwellers were small in stature, black-haired, and had heads flattened perhaps by papoose boards. Side by side with the bodies were found weapons, utensils and ornaments. The only metal objects discovered were small charms made of copper. The weapons were of polished stone; many implements, of bone or flint. Hampers found were no doubt used to carry burdens, and there were brushes made of fibers. Clothing was probably scarce, and much of it, like the sandals, was made of milk-weed fiber. Beads, feathers and bits of buckskin were also found. The great variety of pottery unearthed was always tastefully decorated.

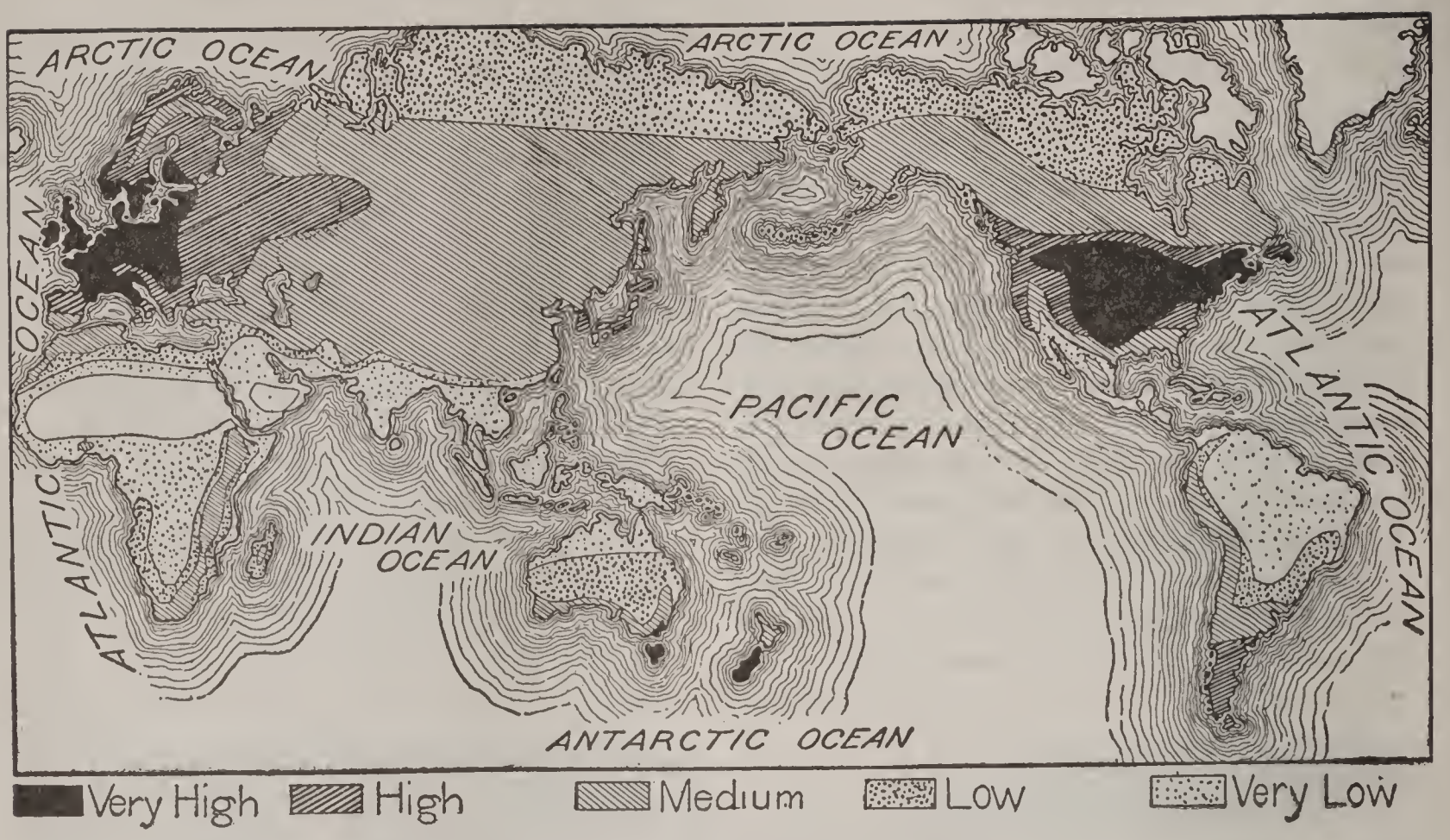
It has been decided that these were an agricultural race who raised maize, beans, watermelons, tobacco and perhaps cotton. Irrigation ditches show their skill and industry. They domesticated the turkey and probably the rabbit and a species of llama.

Their Houses. The peculiar dwellings they built have given to the people their name. Most of them were on the tops of plateaus or high in cliffs and could be reached only by winding, roundabout paths. Sometimes, too, steps were cut in the cliffs. Often these houses were built as high as 800 feet above the level of a river or valley floor. Constructed either of assorted stones held together with moistened clay, or of sun-dried bricks, these dwellings were usually built two or three stories high, each story set back from the one below, leaving flat, open roofs or courts. The lower story had no windows, and entrance was obtained by means of ropes or ladders which led up on the outside to a hole in the roof. A ladder on the inside was then let down, and the outer ladder could be drawn up, thus guaranteeing safety from enemies. The rooms were generally very small, but there were many of them. Some rooms had fireplaces, and always there was one room half underground which the Spaniards called *estufa,* which, it is said meant *council chamber,* where the principal men of the tribe assembled. In some of these *estufas* crude pictures are found painted on the walls

A cliff palace.

Cave dwellings of a great "Sun House."

TYPE OF HOMES OF THE CLIFF DWELLERS



CLIMATE IN ITS RELATION TO ENERGY
The map shows roughly the distribution of human energy.

in green, perhaps obtained from carbonate of copper, in black from charcoal, yellow from yellow ochre, and white, probably from kaolin.

One "cliff palace" in Cliff Canyon in Southwestern Colorado is 421 feet long, contains 127 rooms and is capable of affording shelter to 1,500 persons. The best-preserved cliff dwelling ruins are found in Colorado, and the Federal government is restoring some of the most interesting ones. One of the sights of interest to the tourist out of Colorado Springs is an exact reproduction of a small cliff dwelling ruin, with an exhibit of ancient relics of this race. M.S.

Consult Nadaillac's *Prehistoric America; Bulletin 52* of the Bureau of American Ethnology, Smithsonian Institution, Washington, D. C.

CLI'MATE, the general average of temperature, moisture and other weather conditions in any certain region or locality. The climate of a place, therefore, may be hot or cold, wet or dry, healthful or unhealthful, according to the kind of weather, or meteorological, conditions, which have prevailed there for a great number of years. *Climate* may be said to be a settled or regular condition, for no very marked change has been known to occur in the climate of any region in 2,000 years. *Weather,* on the contrary, is a present atmospheric condition, and may change daily.

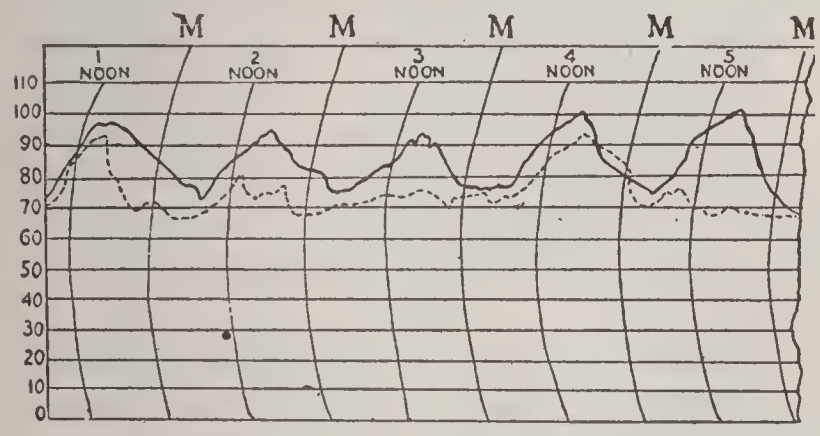
Influence of Climate on Civilization. Climate is the most potent factor in determining the civilization, vegetation and animal life of a region. In the tropics, wherever the equatorial rain belt prevails, animal and vegetable life are abundant, but the excessive heat is apt to prevent the people from developing enterprise and energy. In the frigid zones, where there is little or no vegetation, the few people have difficulty in living and cannot develop the arts and sciences. Thus it will be seen that in the great temperate zones, where cold and heat succeed each other, and where neither is extreme, are developed the great civilizations of the world.

Factors of Climate. Climate is the result of a number of factors, or determining influences. These are chiefly latitude, altitude, distance from the sea, winds, mountain ranges, rainfall, inclination of the earth's axis and ocean currents. In general, the warmth necessary to sustain life comes from the sun; the sun warms the earth, and the earth in turn warms the air.

Latitude. The latitude of a place is the chief factor in determining its average warmth, or mean temperature, and the mean temperature of a place computed for not less than ten years is its "normal" temperature. At the equator the rays of the noon sun are practically vertical and in every part of the torrid zone they are vertical during a part of each year. Beyond the tropical circles they fall more and more obliquely as the latitude increases; therefore these parts of the earth receive less and less warmth as the latitude increases. If the earth were a perfectly smooth land mass, all places in the same latitude would have the same tem-

perature; but this is not the case because there are so many modifying influences, altitude and distance from the sea being the most important.

Altitude. Altitude, or height above sea level, affects temperature. The air grows thinner and receives less heat from the earth in proportion to the distance one rises, the temperature falling one degree for about every 300 feet of



CLIMATE AND TEMPERATURE CHART

The diagrams show the variations in temperature in Chicago, Ill., and Peoria, Ill., on the same days. The solid line represents Peoria, the broken line, Chicago. The latter city is on the shore of a great body of water; the former is over a hundred miles inland.

elevation. Thus, even in the tropics, a wide range of temperature may be found in ascending a lofty mountain range—one of the Andes or Himalaya mountains, for instance. At the foot one experiences the temperature of the tropics; at 6,000 feet up, that of the temperate zone; at the summit, the eternal cold and snow of polar regions. The great plateaus of the tropics, which usually are at an altitude of 5,000 to 6,000 feet, have a cool climate.

Distance from the Sea. The position of a place or country with respect to the sea or to other large bodies of water also determines largely its climatic features. All places adjacent to the ocean or to the Great Lakes have a much more equable climate than those situated in the interior of a continent; the fact that the water is cooler than the air in summer and warmer in winter modifies the extremes of temperature. Such places therefore are cooler in summer and warmer in winter than locations farther inland.

Winds. An examination of a wind chart (see WIND) shows that in equatorial regions the great air currents forming the trade winds have a northerly origin north of the equator and a southerly origin south of it. They tend therefore to modify the warmth of equatorial regions. In each temperate zone the prevailing winds originate in warm regions and blow into the colder regions of higher latitudes. When the moisture mingled with the air falls as rain an enormous amount of latent heat is set free, warming the air still more. Thus the west coast regions of the continents which are in the temperate zones have much milder winters than those of corresponding latitudes on the east side of the continents. Because of warm southwesterly winds, the winters of Sitka, Alaska, are not colder than those of Philadelphia, nearly twenty degrees farther south. The climate of England is mild; that of Eastern Canada is hotter in summer and colder in winter.

The prevailing westerly winds also perform another important office. They blow the surface water of warm ocean currents into great drifts, and the warm water keeps the harbors and fiords in high latitudes free from ice during long winters. Because of the wind-blown drift of warm water, Hammerfest, a port within the Arctic Circle, is open all the year; on the other hand, the fiords of Labrador, considerably farther south, are ice-blocked more than half the year. Cold ocean currents have the opposite effect. The cold current coming down from Baffin Bay hugs the Labrador coast, carrying icebergs and cold fogs far into southerly regions. A cold current coming up from Antarctic waters flows around the lower part of South America and similarly affects its climate.

Mountains and Rainfall. Mountain ranges act as barriers and by preventing the free passing of winds from one region to another influence climate. The rainfall of localities is greatly affected by these mountain barriers. A wind passing over mountains leaves its moisture on the windward side and becomes a hot, dry wind on the opposite side. Thus the Pacific coast has an excessive rainfall, while some of the regions east of the mountains are hot and arid and are called the Great American Desert. The Sahara Desert in Northern Africa likewise is the result of mountain barriers, and the hot winds that blow from it and are intercepted by the Pyrenees and Alps make the climate of the Mediterranean region very much warmer than that in the same latitude elsewhere. Naples, Italy, has a semitropical climate, but it is almost in the same latitude as New York City in the United States.

Inclination of the Earth's Axis. The inclination of the earth's axis is one of the most important factors in climate. In the torrid zone it causes the movement of the equatorial rain belt north and south, giving nearly every part of the torrid zone an abundance of rain. In temperate zones it causes the alternation

of summer and winter, and in the frigid zones it causes the alternation of six months of sunshine with six months of darkness.

Rainfall. A region without rainfall is practically uninhabitable. The history of agricultural industries shows that a yearly rainfall not much less than twenty inches nor much more than forty inches is required for the world's wheat crop; that is, about 5,000 pounds of water are required for every pound of wheat. If the annual rainfall is less than twenty inches, food crops, with the possible exception of grass, must be helped by irrigation. If the annual rainfall is materially greater than fifty inches it hinders rather than helps most food crops. The map of the distribution of rainfall compared with that of the density of population shows that most of the people of the world live in regions having an annual rainfall varying from twenty to forty inches, and also that such regions in the temperate zones will yield enough foodstuffs for nearly 100 persons per square mile.

Soil and Vegetation are also climatic factors. Sandy regions are always warmer than those with a clay soil; and where there are forests and abundant vegetation, the climate is more equable and the rainfall nearer normal for the location.

An *isothermal map* forms one of the most interesting studies in temperature. In following the lines which show the average temperatures of all parts of the earth's surface it is interesting to note how little degrees of latitude sometimes have to do with climate. J.R.

Related Subjects. The following articles in these volumes relate to the subject of climate, and will make more clear and more interesting certain phases of the general topic:

Acclimatization
Air
Antarctic Circle
Arctic Circle
Blizzard
Calms, Regions of
Chinook
Cloud
Cloud-burst
Cyclone
Desert
Dew
Doldrums
Dust, Atmospheric
Equator
Equinox
Fog
Frost
Glacier
Gulf Stream
Hail
Horse Latitudes
Humidity
Hurricane
Isobars
Isothermal Lines
Japan Current
Labrador Current
Land and Sea Breezes
Latitude
Lightning
Meteorology
Monsoon
Norther
Ocean Currents
Prevailing Westerlies
Rain
Seasons
Simoom
Sirocco
Snow
Snow Line
Storms
Tornado
Trade Winds
Tropics
Typhoon
Weather Bureau
Wind
Zone

CLI'MAX, in rhetoric, is the arrangement of words or clauses in the rising order of their importance, a most effective device when used by a skilful writer or speaker. Probably the best-known example of climax is Julius Caesar's terse announcement to the Roman Senate, "I came, I saw, I conquered." The beautiful passage from the ninth chapter of *Isaiah,* which is used with such stirring effect in Handel's oratorio *The Messiah,* is one of the numerous examples of climax found in the Bible: "And his name shall be called Wonderful, Counsellor, the mighty God, the everlasting Father, the Prince of Peace."

Climax is used with striking effect in oratory, an illustrious example being the following passage from Patrick Henry's eloquent speech against England before the Virginia delegates to the provincial convention which met at Richmond in 1775: "We have *petitioned;* we have *remonstrated;* we have *supplicated;* we have *prostrated* ourselves before the throne." Few stronger climaxes have been uttered in any age of the world's history.

Anti-climax is the reverse of climax, the arrangement of ideas in the descending order of their importance. Ordinarily the use of anti-climax serves to make a sentence weak, and should be avoided. The argument used by the country clergyman against swearing is a good example of anti-climax: "Oh, my brethren, avoid this practice, for it is a great sin, and, what is more, it is ungenteel." Very often writers deliberately resort to anti-climax in order to produce a humorous or sarcastic effect, as in the following lines from Pope:

> Go, soar with Plato in the empyreal sphere,
> To the first good, first perfect, first fair;
> Go, teach Eternal Wisdom how to rule,
> Then drop into thyself, and be a fool.

CLINTON, a town in Huron County, Ontario, 130 miles west of Toronto and fifty miles north of London, on the Buffalo-Goderich branch of the Grand Trunk Railway, twelve miles southeast of Goderich, thirty-three miles northwest of Stratford, and seventy-three miles northwest of Hamilton. The town is known for its manufacture of pianos and organs, automobiles, boys' clothing, knit goods and flour. It also ships grain, live stock and salt obtained from the neighborhood. Population in 1911, 2,254; in 1916, about 2,600.

CLINTON, De Witt (1769-1828), an American statesman whose name is inseparably con-

nected with the Erie Canal, for he faithfully devoted the best years of his life to the promotion of that work. He was born in Little Britain, N. Y., and completed his education with honors at Columbia College. He was admitted to the bar in 1788, but his earnest ambition soon carried him into politics, first to the assembly, then, in 1798, to the New York state senate, and in 1801 to the United States Senate. In 1803 he was elected mayor of New York, an office which he held for twelve years, excepting two short intervals. During that period he was again a member of the senate of New York, and was lieutenant-governor of the state for two years. In 1812 he was defeated by Madison for President of the United States, but in 1817 was chosen governor of New York state, and to this position he was reëlected three times. All his life he worked in the interest of a waterway which should connect the Great Lakes with the Atlantic seaboard. During his third term, in the autumn of 1825, he was triumphantly carried on a barge from Buffalo to New York along the canal which his untiring effort had made a reality. The story of this effort and its results is told under the title Erie Canal.

DE WITT CLINTON

CLINTON, George (1739-1812), an energetic soldier and statesman, born at Little Britain, N. Y. He served prominently in the Revolutionary War and was of great service to the colonial cause through his influence with the Indians. Because he was a very popular patriot he was elected to the New York assembly; in 1775 he was sent as a delegate to the Continental Congress. In 1777 he was appointed a brigadier-general in the Continental army, and later in that year was made first governor of the state of New York, serving in this position for eighteen years with exceptional ability and discretion. He opposed the Federal Constitution on account of its centralization of power, and advocated improvement of internal communication by navigation companies. In 1804 he was elected Vice-President of the United States, an office which he held until his death, serving with both Jefferson and Madison. In 1811 it was his vote which defeated the rechartering of the United States Bank. De Witt Clinton (which see) was his nephew.

CLINTON, Sir Henry (about 1738-1795), a British general who saw active service in the American Revolution, beginning at the Battle of Bunker Hill, where he fought as major-general. After Washington's defeat in the Battle of Long Island in 1776, Clinton took possession of New York, and as a reward for his share in the American defeat was knighted and raised to the rank of lieutenant-general. In 1778 he was placed in chief command of the British forces in America, with his headquarters at Philadelphia. When he heard of Burgoyne's surrender and the news of the French alliance with the American cause, he evacuated Philadelphia and began a retreat through New Jersey. Washington hurried after him, and the two armies fought a battle at Monmouth Courthouse in June, 1778, in which the British were defeated.

Clinton then stationed his forces at New York, where he remained until December, 1779. At that time he led an expedition into South Carolina, capturing Charleston in the following spring. After his return to New York, he planned to go to the aid of Cornwallis, but his expedition started southward on the day the latter surrendered. In 1782 the chief command was given to Sir Guy Carleton, and Clinton returned to England. Thereafter he served in Parliament and as governor of Gibraltar.

CLINTON, Iowa, the county seat of Clinton County, in the easternmost section of the state, on a wide curve of the Mississippi River. Chicago is 138 miles east, Cedar Rapids is ninety miles west, and Des Moines is 225 miles west and south. By water, Dubuque is sixty miles north and Davenport is forty miles south. One railway and two wagon bridges connect with East Clinton and Fulton, across the river. The Chicago & North Western; the Chicago, Milwaukee & Saint Paul; the Chicago, Burlington & Quincy, and the Chicago, Rock Island & Pacific railways serve the city. Interurban lines also connect with Davenport and other adjacent cities. In 1910 the population, chiefly American, was 25,577, which had decreased to 24,151 in 1920. The area is a little less than nine and one-half square miles.

Clinton is an attractive city with broad, shaded streets, lying between the river and a range of bluffs. Great efforts have been made

by the people to have an ideal city, and their degree of success is possibly one reason why it is locally called *The Bright Spot*. Riverfront Park, Eagle Point Park and De Witt Clinton Park contribute their share to the beauty of the city. A post office erected at a cost of $100,000 in 1902, an $80,000 Coliseum and a Scottish Rites Cathedral are the most notable buildings, but there are some substantial business buildings and a number of fine churches. Mount Saint Clare Academy, Our Lady of Angels Seminary, Wartburg Lutheran College, a business college and a Carnegie Library supplement the public school system.

The region within a radius of fifty miles has Clinton for its main trading center; it is a distributing point for timber and its saw mill industry is important. The principal industrial plant, however, is a sugar refinery which has an annual output valued at $5,000,000. Furniture, gasoline engines, boats, automobiles, wagons, harness, locks and wire-cloth are manufactured here, and there are cracker and sash-and-door factories, and iron bridge works. An iron drawbridge across the river at Clinton cost $600,000 to construct and has a length of 4,100 feet. The machine shops of the Chicago & North Western Railway are located here.

The city was founded in 1855 by the Iowa Land Company, was incorporated in 1857 and named in honor of De Witt Clinton, the American statesman. In 1867 the city was again incorporated, this time under a law of the state for the incorporation of cities. In 1890 Lyons, with a population of 5,800, was included within the city limits. O.T.R.

CLINTON, Mass., one of the earliest and best-known manufacturing towns in the United States. It is in Worcester County, in the northeastern part of the state. Boston is thirty-five miles east, Worcester is twelve miles southwest, and Lowell is twenty-five miles northeast. Clinton is on the Nashua River and on the Boston & Maine and the New York, New Haven & Hartford railroads. The area of the city is about five square miles. The population in 1910 was 13,075; in 1920 it was 12,964. Americans predominate, but there are a large number of Irish and Germans. Clinton is picturesquely situated in hilly country. Nearby in 1896-1905 was built the immense Wachusett dam and reservoir, the main source of the metropolitan water-works system which supplies water to Boston and eighteen cities and towns within a radius of ten miles of the State House.

Three manufactories of international reputation, making ginghams, wire-cloth and carpets, are located at Clinton. They were all founded by Erastus Brigham Bigelow, one of the incorporators of the Massachusetts Institute of Technology, and an inventor whose various looms revolutionized the weaving industry. The Lancaster mills, making ginghams, employ over 2,000 workers. Machinery, thread, worsteds and yarns are also manufactured at Clinton. The city has one of the finest municipal buildings in the state; it also has the Clinton Historical building, a public library, a hospital, a home for aged people, and an attractive union railway station.

The earliest settlement on the site of Clinton was made in 1645. It was included in Lancaster until 1850, when it was incorporated as an independent town. E.G.O.

CLISTHENES, *klis'the neez,* an Athenian statesman who introduced *ostracism,* or banishment by public vote, and who was one of the first to suffer this punishment. He was a member of the celebrated family of Alcmaeonidae and was noted for his democratic tendencies. Some of his plans for reform met with popular approval, but he was eventually forced to retire from Athens in disgrace. The date of his birth and death are unknown, but many of his improvements in the Athenian constitution are dated about 510 B.C. See Ostracism.

CLIVE, *klyve,* Robert, Baron Clive of Plassey (1725-1774), the military and administrative genius to whom Britain owes its empire in India. In his day the government of English colonies east of the Cape of Good Hope was vested in the East India Company, to whom the eighteen-year-old Clive was sent as a "writer," a clerk of the lowest degree, because of his fondness for adventure and apparent inability to apply himself to school work.

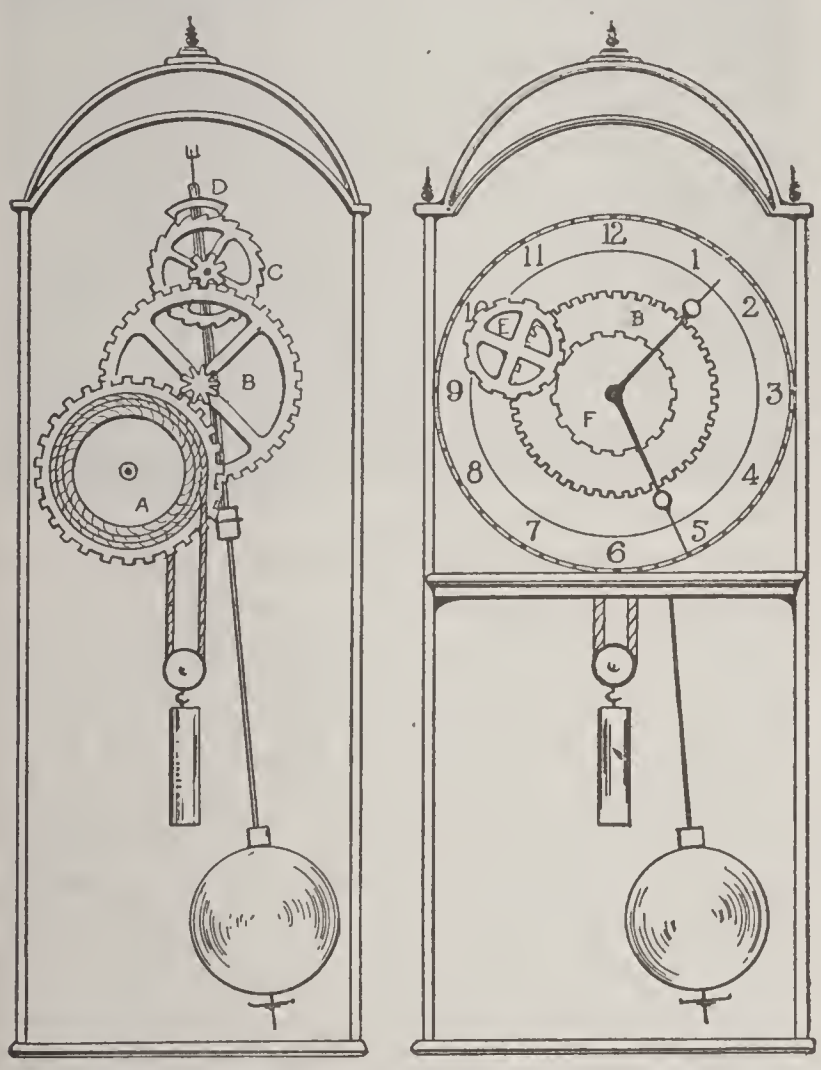
Clive began his military career in 1747 as an ensign, after escaping from a French prison at Pondicherry. In 1751, in command of only 320 natives and British and aided by inexperienced officers, he successfully defended Arcot against thousands of fanatical Mohammedans, and followed this exploit by several victories in the field. In 1757, at the Battle of Plassey, he established British supremacy in India by routing over 50,000 natives with his 3,200 men.

At his home-coming in the year 1760 Clive was given his title, and he entered Parliament. Five years later he was returned to the East

to revive the ebbing fortunes of the Company. He secured the formal allegiance of the Mogul emperor, reorganized the army and reformed the civil administration. He reëntered Parliament in 1767.

In 1773, after a committee investigation of the affairs of the East India Company, a vote of Parliament put on record that Clive had gained a fortune of £234,000 during his first administration, but that he "did render great and meritorious service to his country." It is quite certain that none of the presents which Clive had received from Indian princes were bribes. But the shadow cast on him deeply stirred his morbid temperament, and he ended his own life the next year.

CLOCK, a mechanical device for measuring and indicating the time in hours, minutes and seconds. From the very earliest time man



THE MECHANISM OF A CLOCK
Explanation of the parts appears in the text.

naturally desired to have some means of recording the passage of time, and the modern clock, instead of being a single invention, is in reality the result of a more or less gradual growth of ideas. The Indians of North America prior to the coming of the white man measured time by *moons,* each moon measuring the time from one new moon to the next, or twenty-eight days. The hours of the day were indicated by the height of the sun. An appointment might be made for two men to meet "so many moons" hence at a certain spot, at the hour when the sun had risen to the height of some particular tree. Such methods, though primitive, were practical, for the Indian could tell the time by the sun almost as correctly as the modern city dweller can by his clock.

The invention of the clock must be attributed to the Chinese, best authorities agree, at least 2,000 years before the Christian Era. If such be the case, the art of clock-making was long lost, for it was not known to Western countries until many centuries later. In the fourteenth century clocks were produced by Germans, who continued to improve on their first attempt, and it is probable that the perfected clock of to-day is due to the efforts of German scientists. Monks in the fourteenth century also played an important part in the development of clocks, because their religious observances demanded careful adherence to a time schedule.

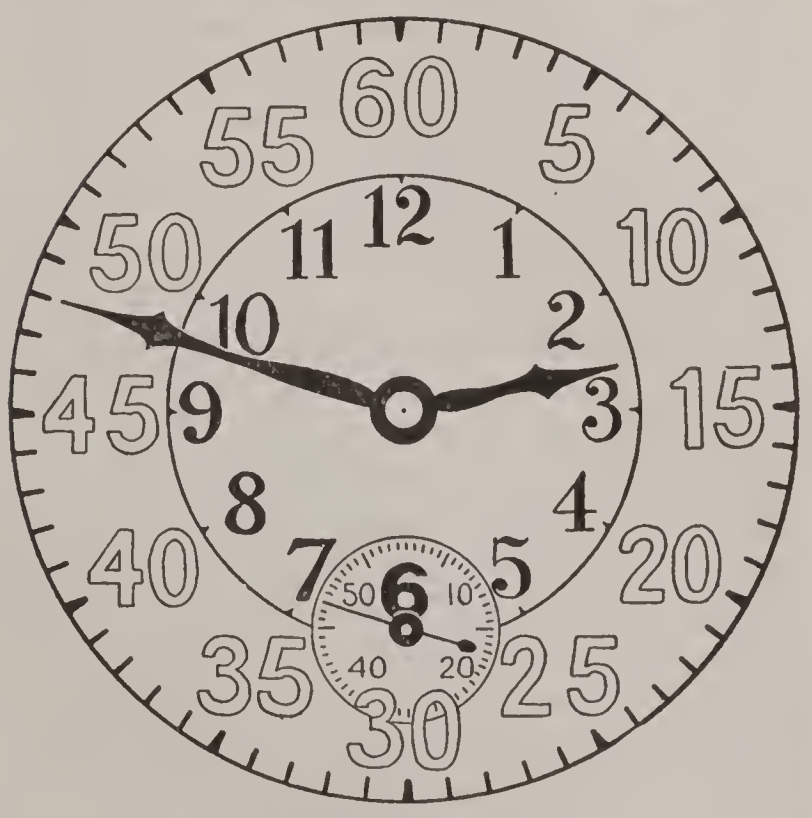
Essential Parts. The necessary parts of a clock are a set or train of wheels and a weight or spring to set and keep them in motion. There must be a face, or dial, and hands, or pointers, to indicate the time. The accompanying drawing illustrates the working principles. Before a clock's mechanism can be set in motion it must be "wound up." That means winding a chain round a barrel or drum, which is marked *A* in the picture. The weight at the end of the chain slowly falls, and as it does so it causes the drum *A* to revolve. The wheel marked *B* is then made to turn, as it is connected to *A* by cogs. The turning motion is passed on to the wheel *C* in the same way. To prevent the weight from falling too fast and making the wheels turn too quickly there is a little device called the *escapement,* marked *D,* connected with a pendulum. This curved piece of metal has a tooth at each end, which fits into cogs in the wheel *C*. The pendulum as it swings to right and left moves *D* up and down and releases the wheel *C,* one cog for each swing, or tick. Instead of making the clock go, as is often supposed, the pendulum prevents the wheels from turning too rapidly. It also acts as a regulator; shortening the pendulum by means of a screw makes it swing more rapidly, while lengthening it makes it move more slowly.

The second illustration shows the face of a clock and the wheels which cause the hands to move. Wheel *F* makes a complete revolution once every hour and carries the long, or

minute, hand with it. Wheel *E* is made to move by touching wheel *F*. At the back of wheel *E* is another smaller wheel with only six teeth; these fit into teeth in wheel *B*, which has seventy-two teeth, and carries the hour hand. Turning the small wheel of six teeth causes the large wheel *B*, with its seventy-two teeth, to turn just one-twelfth of the way round. Thus the combination of wheels causes *F* to turn twelve times while *B* turns but once.

Modern Spring Clocks. Though for centuries pendulums and weights were used, requiring perfect equilibrium and permitting only an upright position, it was eventually discovered that clocks could be made without them and that a small steel spring would perform the same office. Instead of having a pendulum, spring clocks are fitted with a balance wheel, which prevents the other wheels from turning too rapidly. Small clocks and watches are made on the same principle, and both were impossible before the adoption of the spring; all that is necessary to start the mechanism is to wind, or tighten, the spring.

Striking Clocks. Naturally when clocks were perfected and the time could be seen by anyone at a glance, the idea of a clock

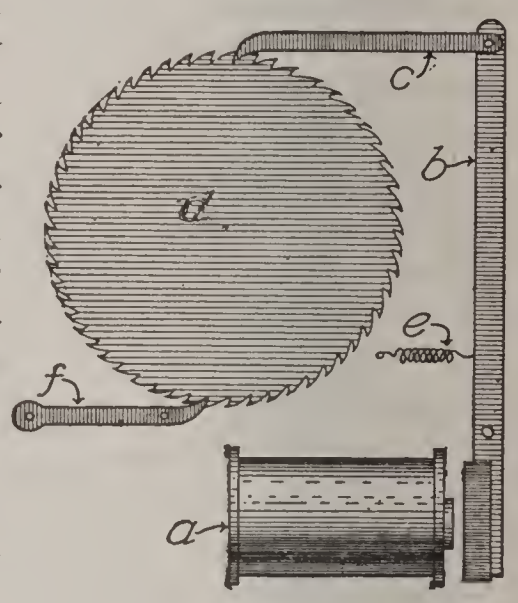


NEW FORM OF DIAL

The inner circle of figures represents the hours; the outer circle, the minutes of the hour. This dial is especially valuable in railway stations.

which would announce the hours so that all in the vicinity could hear was evolved. The striking mechanism is separate from the ordinary time-keeping machinery. A weight or spring sets in motion wheels which release a hammer at certain times. The hammer falls on a bell or rod of metal and announces the hour. Many clocks have elaborate devices for striking chimes on a series of bells, for playing tunes and for making certain figures go through regulated motions at regular intervals. One of the most interesting and complicated of clocks is to be seen in Strassburg Cathedral in Germany. Many clocks, instead of striking the hours, have an attachment which causes a bell to ring at a certain time. These are called "alarm clocks," and are in great demand among those whose business demands early rising.

Electric Clocks. The most important application of electrical knowledge to clock-making is the operation of a number of clocks in different places in unison with a master clock in an observatory, but there are also electric clocks which differ from the ordinary clock chiefly in deriving power from batteries instead of from weights or springs. The picture shows one method of operating either type of clock. The cylinder *a* is an electro-magnet in which the current is alternately excited and broken by the swinging of a pendulum, which in the case of a series of clocks is that of the master clock. When current passes through the coil the lower end of the armature lever *b* is attracted and the pawl *c* pulled back as the lever swings on its pivot. The back-stop *f* prevents the ratchet wheel *d* from slipping. When the current is broken the spring *e* draws the lever back and the wheel receives a push.



Clock-Making Industry. So great is the demand for clocks that the United States alone, besides providing for nearly all its own needs, exports them to the value of $3,000,000 annually. American enterprise, to which is due the introduction of the cheap but efficient steel spring, has revolutionized clock-making throughout the world. For more than 200 years previously coiled springs had been used by European clock makers, but only in the most expensive clocks. Now the spring clocks made in the United States are the cheapest, and in proportion to their cost, the most satisfactory that can be obtained. Fairly reliable clocks can be purchased for one dollar,

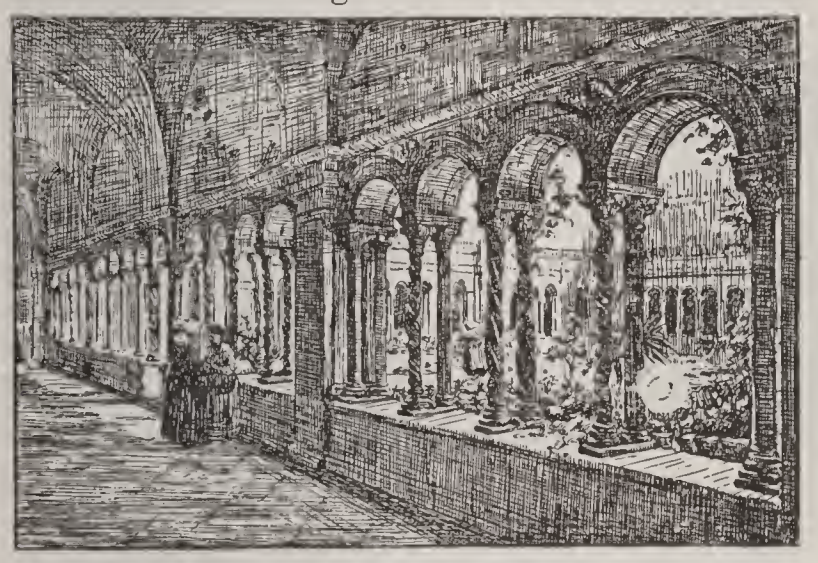
a remarkable fact considering their good appearance and efficiency. This result is due largely to a process of manufacture by which all the numerous parts of a small clock are cut out of a piece of brass by one single stamping operation.

The clock industry in Canada is practically undeveloped, and that country depends almost entirely on the United States and Europe.

Related Subjects. In these volumes the following articles are connected with this subject:

Hour Glass	Sun Dial
Pendulum	Watch

CLOISTER, *klois'ter.* This word, which comes from the Latin *claudere,* meaning *to close,* was at first applied to the entire space enclosed within the walls of the monastery, cathedral or collegiate establishment of the



A CLOISTER
Seen in the foreground, with the garth beyond.

Middle Ages. Later it designated the four-cornered court in the center of the main group of buildings, which was surrounded on all sides by a covered, arched corridor. Sometimes the term is applied only to these corridors; the central, open space, which contained a well and garden, was known as the *garth.* Within the cloisters the monks were accustomed to enjoy their periods of exercise and recreation.

Milton's beautiful lines from *Il Penseroso* illustrate the general association of the word *cloister* with the serene and quiet life passed within the monastery:

> But let my due feet never fail
> To walk the studious cloisters pale,
> And love the high embowered roof,
> With antique pillars massy proof,
> And storied windows richly dight;
> Casting a dim, religious light.

CLOSED SHOP, a workplace in which only members of labor unions are employed. See Open Shop; Labor Organizations.

CLOTH, the woven materials used for our garments and many of the furnishings in our homes. The first covering used by man was made of foliage, then, for warmth, the skins of animals and feathers of birds were used. But animals became more scarce each year, and finally the wool of sheep was used, twisted into threads and woven for use as garments. So the term *cloth* originally applied to woolen fabrics. Then down through the ages the value of cotton, flax, silk and fibers of hemp, jute and other plants was discovered, and the primitive methods of weaving were gradually improved until now the making of cloths of all kinds is a world-wide industry.

Cloth is woven on the loom (see Weaving). Two sets of threads are used, the *warp* threads running lengthwise of the goods, and the *weft,* or *woof,* threads running in and out across the warp. The edge of cloth woven to prevent raveling is called *selvage.* The warp is sometimes called the *back,* or *foundation,* of goods, and the woof, the *filling.* When the warp of a piece of goods is of cotton and the weft of silk, it is described as having a cotton back and a silk filling (see Weaving). All-wool cloths have both warp and weft of wool, but most cloth sold as wool contains some cotton or other fiber. Worsted goods are made of well-twisted combed wool (see Worsted).

The width of cloth depends on the number of warp threads. Its fineness or coarseness depends on the size of threads used and their distance apart. According to the way in which weft threads are woven across the warp, cloths are *plain,* like muslin, *twilled,* like tweeds, *piled,* like velvet, *figured,* like damask, *mixed,* like cheviot, or *checked* or *striped,* like gingham.

Serges, cashmeres, Henrietta and covert are some of the most commonly known cloths of wool. Muslin, calico, gingham, some cambrics, canvas, duck and dimity are widely-used cotton cloths. Made of flax are the linens, including lawns, sheetings, toweling and some cambrics. Pongee, crêpe de Chine, foulard, taffeta and surah are some of the best-known cloths of silk. So varied are the methods of manufacture that a single description will not apply to all cloths.

"Costly thy habit as thy purse can buy," is a wise phrase of Polonius in *Hamlet,* though often ascribed in error to Benjamin Franklin, in *Poor Richard's Almanac.* Fortunately cloth is made to meet the demands of every purse.

Each principal kind of cloth named above is described in its place in these volumes, and a study of these will identify the various fabrics

with respect to utility and comparative values. Some details of manufacture are also included.

CLOUD, *klowd.* Some clouds assume the shape of great, fleecy masses, some are feathery formations far in the upper air, and some are dull gray or black sheets which darken the earth and give promise of rain; but whatever their appearance, the formation is always the same. They are merely atmospheric moisture, condensed until it has become visible; in other words, they are upper-air fogs. That this is true the mountain-climber can bear witness. From below he may see clouds high above as rolling masses, veiling the summit of the mountain; as he ascends he loses sight of cloudlike forms but finds himself gradually enveloped in a heavy mist; and when at last he comes out upon the sun-bathed peak he can turn and see the mist again as heaving billows of cloud below him.

When the sun warms the surface of the earth, water reached by its heat loses its liquid form and is transformed into gaseous vapor. This vapor rises, and as it cools by expansion in the light upper air it is condensed again into the tiny particles of water or snow or ice which form the clouds. As their weight causes them to sink, these liquid particles come again to the warmer layers of air and are once more vaporized and become invisible. So goes on the ceaseless change that we can nearly always observe in cloud shapes as they float past us, and that makes them, as Emerson has said, "always and never the same." Clouds or banks of fog are also formed when winds carry warm atmosphere into a cold region or cold air into warmer lands, for the result is exactly the same as when we "see our breath" on wintry mornings.

Every Cloud Has a Name. Because of the indication they give of weather conditions present and to come, clouds have been closely studied by men of science. To each shape of cloud has been given a name descriptive of it, and as the shapes depend upon the conditions within and around the cloud masses, the names ought to be known by all who like to "discern the face of the sky." Though they are Latin, most of them can be easily remembered by their resemblance to English words.

Cirrus to a Roman meant a ringlet of hair, and so the name was given to the curly white cloudlets of ice crystals which form high above all other clouds, five to ten miles above the earth's surface. The word *cirrus* may be recalled because it is similar to *circle.*

Stratus, which in Latin means *spread out,* is like the word *stratum,* the geological term for a *layer.* Stratus clouds are the most foglike, and are generally very close to the earth. They are oftenest seen at morning and evening, when the still air contains no currents to break them up.

CLOUD FORMATION

(1) Cirrus, cirro-stratus and stratus; (2) cumulus; (3) strato-cumulus; (4) nimbus.

Cumulus means a *heap* (as we see in our word *accumulate,* which is to *pile up*) and cumulus clouds are the beautiful heaped-up masses of white that float across the sky on lovely summer days, casting swiftly-moving shadows on the earth. It must have been a cumulus that inspired the conversation between Hamlet and old Polonius:

Do you see yonder cloud that's almost in shape of a camel?
By the mass, and 'tis like a camel indeed.
Methinks it is like a weasel.
It is backed like a weasel.
Or like a whale?
Very like a whale.

Cumulus clouds travel at a height of perhaps a mile. In midafternoon, when the sun's rays are the warmest, the heaps increase in number and in size as more and more water is drawn up by evaporation, but when comes—

The evening beam that smiles the clouds away,

they lose their beautiful dream-like shapes in the flat monotony of stratus clouds. A great number of heavy cumulus clouds often portends rain, which comes when the atmosphere contains more moisture than it can support.

Nimbus is the very word which the Romans

gave to a rain cloud. A nimbus is a rather shapeless formation, for its lower half contains the falling rain-drops.

The cirrus, the stratus, the cumulus and the nimbus are the four chief types of cloud forms, and from them most others take their names. Among frequently-seen combinations are the cirro-stratus and strato-cumulus shown in the accompanying illustration, and the cirro-cumulus, a group of fleecy little cumulus clouds, a fair weather sign which most of us call a "mackerel sky."

The Poetry of Clouds. Like most works of Mother Nature, the cloud has always been a favorite symbol of other things, either, as in Browning, of temporary misfortunes, or, as in Shakespeare, of great heights. One poet alone has caught the spirit of the cloud as other poets have discerned the heart of the flower, the tree or the brook. Here are parts of the first and last stanzas of Shelley's *The Cloud:*

I bring fresh showers for the thirsting flowers,
From the seas and the streams;
I bear light shade for the leaves when laid
In their noonday dreams.
From my wings are shaken the dews that waken
The sweet buds every one,
When rocked to rest on their mother's breast,
As she dances about the sun.

I am the daughter of earth and water,
And the nursling of the sky;
I pass through the pores of the ocean and shores;
I change, but I cannot die.

Cloud-Burst. In desert and mountain regions a not unusual occurrence is a sudden heavy deluge of rain, lasting only a few minutes and covering but a small area, falling with such terrific force that it seems as though a reservoir in the sky had broken and emptied its entire contents at once. In such a cloud-burst it is impossible for the ground to absorb its usual proportion of moisture, and raging torrents are quickly formed in stream-beds and even in usually dry valleys. Many of the most beautiful of nature's works, such as the fantastic promontories of the Grand Canyon in Arizona, have been carved by these torrential floods.

Scientists can give no satisfactory explanation of the origin of cloud-bursts, for the simple reason that they do not yet fully understand how rain of any sort is formed. The space covered by a cloud-burst is seldom more than a few acres and the rainfall may be as much as five inches in fifteen minutes. C.H.H.

CLOVER, *klo'ver,* one of the most useful and attractive herbs, found in tufts wherever blades of grass will grow, along roadsides or on lawns; or cultivated in great fields for hay, pasture, cover crops, green manuring, for use as green fodder or for soil improvement. Commonly, clover has three rounded leaves, but sometimes there are more. Who has not searched for the "four-leafed clover for luck," or having found a five- or six-leafed clover has not thought of the old superstition that evil would follow? Most children have discovered what the bees have always known—that the purple, red, pink, white and yellow dense heads or spikes of blossoms hold stores of nectar. Because bees get so much sweetness from clover, the term, "to live in clover," means the height of luxury and plenty.

CLOVER

Leaves and blossoms. (*a*) White clover; (*b*) red clover.

Varieties. There are about 300 species of clover, some of which are merely weeds, but many are of immense value for the uses mentioned above. The common *red clover,* native of America and most parts of Europe and now cultivated in other countries, is the most important. It grows in temperate climates from six inches to two feet high and blooms from April to November, and as it lives for two years, it is classed as a biennial (which see). It is used for hay, for pasture and for enriching soil. It is excellent food for milch cows, sheep and young stock. And its roots gather so much nitrogen, which they leave in the soil, that it is an excellent crop to restore fertility to worn-out lands. Bumblebees are absolutely necessary for the fertilization of the clover, however, and the experience of the Australians with this valuable little plant is interesting. They imported large quantities of clover to plant for fodder, but left the bumblebee behind, so the next year there was no clover seed for planting, and no crop could be raised until bumblebees were introduced.

White clover is also very valuable for pasturage, and its fragrant blossoms furnish nectar for the highest-priced honey on the market. It is seldom grown alone, however, as it does not yield as much as red clover. It is usually mixed with grasses and other clovers.

Alsike, or *Swedish clover,* is like the white clover, but has straighter, stouter and more juicy stems. It is strongly recommended for cold, moist, stiff soils, and is the only clover which can be grown by irrigation.

Then there are the *crimson,* or *Italian clover,* used as a cover crop in orchards, sometimes cultivated for grazing and hay, and also raised by florists for ornament; the *Dutch,* or *honeysuckle clover,* a good bee plant; the *yellow,* or *hop clover,* of the roadsides; the white sweet or *tree clover,* so common in prairies; the silky flowered, gray-pink *rabbit-foot clover,* just an attractive little plant on worn-out lands; and numerous others.

The value of clover as a soil-improving crop is being realized more and more each year, but in many sections it no longer grows as easily as at one time. In some places certain necessary elements in the soil have been exhausted, in others diseases have caused failures of the crop. Covering with straw and burning to prevent spread is the best cure for clover-rust, clover-rot, leaf-spot and dodder, and plowing under is advised if one would be rid of the worst clover insect pests.

Before planting, to obtain a good, clean crop, the seed should be carefully examined and wire-cloth screened to remove weed seeds, especially dodder. Good red clover seed is plump, shiny and colored from violet to light yellow. Toledo, O., is the greatest clover seed market.

Value of Clover Crop. The United States produces about three and a quarter million tons of clover annually, valued at nearly thirty million dollars. The East North Central states furnish over half that amount, Illinois leading in individual production, followed by Indiana. Almost twenty-five million tons of timothy and clover mixed are produced each year, valued at about $260,000,000.

The hay and clover crop in Canada amounts to about eleven million tons yearly, valued at $155,000,000, Quebec and Ontario contributing most of the product. M.S.

CLOVES, *klohvz,* a spice, the dried, unopened flower buds of a tree which is a native of the Molucca, or Spice, Islands. It is now cultivated in Sumatra, Jamaica, the West Indies and Brazil. The tree is a handsome evergreen, from fifteen to thirty feet high, with large, oval, smooth leaves and numerous purplish flowers on jointed stalks. When gathered, between October and February, the buds are

CLOVES
Flower, leaves, and cross-section of bud.

reddish. They are then dried and in the drying process turn dark brown. They yield a very fragrant odor, and have a bitterish, sharp, warm taste. This spice is used chiefly in cooking, but yields an oil much prized for flavoring desserts and candy and for scenting soaps. The oil of cloves is also used medicinally; in cases of toothache it will deaden the pain, but it lacks curative properties. The name *clove* comes from the French word *clou,* meaning *nail,* and was suggested by its shape.

CLOVIS, *klo'vis* (466-511), a noted warrior and king of the Franks. He was the son of Childeric I, and in 481, at the age of fifteen, succeeded his father on the throne. Clovis was very ambitious, which fact led him into war. When a mere youth he attacked with his army the Roman general Syagrius and completely vanquished him at Soissons, which he afterward made his home. He is said also to have conquered the whole of Belgica (modern Belgium), of which Rheims was the capital.

His wife was a Christian princess of Burgundy. She greatly desired the conversion of the king, but he remained a pagan until the close of his successful war with the Alemanni, when, in fulfilment of a vow, he was baptized at Rheims. This was an important event to the orthodox Christians of Western Europe, who afterward looked to him to support them against the Arians. After the conquest of

the Visigoths, the kingdom of Clovis extended to the Pyrenees. He later became king of all the Frankish tribes, and was the founder of the Frankish monarchy. See FRANKS.

CLUB, *klub,* a body of men or women organized to promote some particular object, whether literary, political or merely social. The derivation of the word indicates something of the nature of such an organization, for club comes from an old word meaning *to divide,* and has reference to the fact that the expenses of a club are divided among the members.

Historical Clubs. The first club that really made a place for itself in history was that to which Shakespeare, Raleigh, Beaumont and Fletcher belonged. It met at the Mermaid Tavern, in Bread Street, London, and from it went forth judgments and criticisms that strongly influenced the literary life of London. Later came the Kit-Cat Club, named for Christopher Cat, whose mutton-pies graced its banquets; the Beefsteak Club, with its motto of "Beef and Liberty" and its custom of calling its members "Steaks"; and that famous organization known to its members simply as "The Club," but commonly referred to as the Literary Club. Of this organization Dr. Samuel Johnson was the recognized head, though the membership included such brilliant men as Goldsmith, Garrick, Reynolds, Burke and Gibbon. This club still exists in London, though it no longer sways public opinion as it did in its early days.

The earliest clubs were largely social in their nature, but men of like political convictions tended to seek the society of one another, and thus political clubs grew up. In the eighteenth century many a man was made or defeated in public life according as he gained the good or ill will of one of these organizations.

Modern Clubs. Practically all of these clubs, whether literary, social or political, had their beginnings in some tavern or coffee house, and there all future meetings were held, the landlord often finding it worth his while to neglect other patrons for the sake of some such club organized within his doors. Still there was no hint of the club in its more modern sense—the club in which the members actually own the clubhouse and its equipment. This was a product of the early nineteenth century, and had its beginning in associations of army and navy officers who, reduced to half pay on the cessation of the Napoleonic wars, found it cheaper to combine their resources and live under one roof.

From that time on clubs have spread rapidly, and every great city has its organizations which play a more or less definite part in its life. London, for instance, the original home of the club, has no fewer than 100 of note—literary, scientific, artistic, political, athletic and social; and all of these phases of club life are represented in the large cities of Canada and the United States. Some of the buildings possessed by these organizations are very large and sumptuously appointed, and life in them is luxurious in the extreme.

These are clubs in the most formal sense, but along with these have grown up thousands of organizations less ambitious in purpose and less wide in their scope. There are clubs for women, for children, and for men who cannot afford to avail themselves of the privileges of the great city clubs. Some of these less formal organizations are small, some of them have hundreds of members.

Related Subjects. A number of organizations which may be classed as clubs are treated in these volumes:

Boys' and Girls' Clubs
Canning Clubs
Fraternities, College
Women's Clubs

See, also, FRATERNAL SOCIETIES.

CLUNY, *kloo'ne,* in modern times a handsome, though coarse and thick, strong white lace made by hand in Belgium, Germany and Italy. The real cluny is expensive, the price varying with the width and pattern, but machine-made imitations are numerous. Modern cluny lace is used largely for edging doilies, scarfs and tablecloths. There are three ways to detect imitation from real cluny. If two sizes of thread are used and if they are crinkly, irregular and loose, the lace is imitation, as against the real, in which only one size thread, straight and taut, is employed. Imitation cluny is usually made of cotton; the real is made of linen.

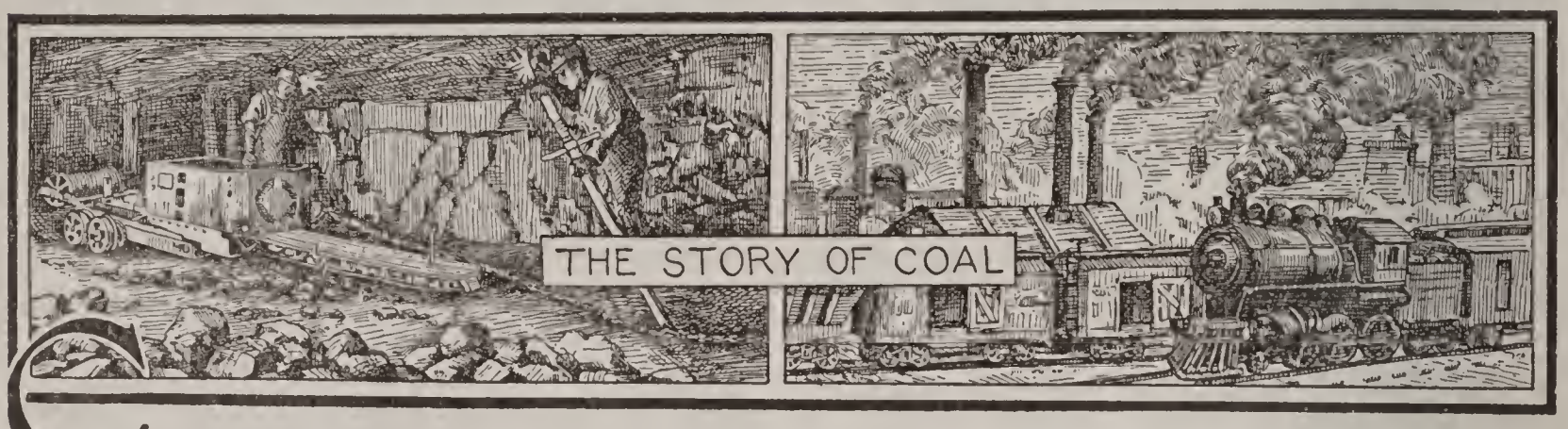
Ancient cluny was a French net lace in which the pattern was darned. This is now known as *antique, fillet* or *spider work.*

The name *cluny* was taken from the museum of Cluny, where samples of ancient lace are kept. This is in the town of Cluny or Clugny, in Eastern France. At one time the most celebrated Benedictine abbey in France was located there, and the abbey church, destroyed in the time of Napoleon, was then regarded as one of the world's wonders.

CLYDE, *klide,* the most important river in Scotland, celebrated throughout the world for the shipbuilding yards which line its banks.

"Built on the Clyde" was formerly as high praise for a vessel as is now the familiar *"A1* at Lloyds," referring to the great London shipping insurance company. The river is formed by a combination of many small mountain streams draining the counties of Lanark, Renfrew and Dumbarton, and flows through some of the most romantic scenery in Scotland. The most important point on its banks is Glasgow, and below this city it gradually expands into the great estuary known as the *Firth of Clyde.* The actual river is only seventy-five miles long; the broad estuary is ninety miles in length. In 1812 the first European steamboat was launched on the Clyde and since that date its waters have received the hulls of thousands of the finest vessels afloat.

CLYTEMNESTRA, *kly tem nes' tra,* in Greek mythology, the unfaithful and treacherous wife of Agamemnon and half-sister of Helen, Castor and Pollux. The poet Homer tells how, during the absence of her husband in the war against Troy, she bestowed her favors on Aegisthus. On Agamemnon's return they murdered him to hide their guilt, and together governed Mycenae for years. Her son Orestes later avenged his father's death by killing both Clytemnestra and her lover. See AGAMEMNON; TROY.



COAL. In 1902 in Pennsylvania, the most important field of anthracite coal in the world, there was a strike of miners. It lasted so long that in some localities factories were obliged to close; in many parts of the country people could not obtain fuel for warming their houses, and before the strike was settled the industrial system of the country was sadly disarranged. This strike illustrated in a very forcible manner the dependence of all industries upon this universal fuel.

What Coal Is. If we burn wood in a closed vessel so that only a little air can get to it we obtain a black substance which is nearly all carbon. We call this substance *charcoal.* What we may do on a small scale in making charcoal, Nature in the past ages did on a large scale in making the coal which we now take from the mines.

Possibly you have stood beside a marsh and noticed that in spots it was filled with a kind of moss, that seemed to be dead underneath and alive on top. Cutting down into this moss usually shows it to have a thickness of several feet, and to be more compact near the bottom than at the top. In Ireland and other regions, America included, this moss occurs in large quantities, and in Europe it is dried and used for fuel under the name of *peat.* Now if this peat had been buried deeply in the earth and subjected to intense heat, it would have been turned to coal, something like the charcoal. We may say, then, that peat is coal in the process of formation.

Ages before man lived upon the earth portions of it were covered with a dense growth of vegetation far more luxuriant than that found now in the densest tropical jungles. By the lowering of the level of the land these vast forests were covered by the ocean, and while resting for ages on the bottom of the sea they were buried in mud. The land again rose and appeared above the ocean. The mud was hardened into rock and the buried vegetation by heat and pressure was turned into coal. This process was repeated many times through the uncounted ages and for this reason we find the coal in veins, one above another and separated from each other by layers of rock. Green plants grow only under direct sunlight. Since the plants of the Coal Period owed their growth to the influence of the sun, coal is sometimes called *buried sunshine,* a very appropriate name.

Mineral coal, as hard and soft coal are generally called, differs from charcoal in several particulars. Since it was formed under great pressure it is more compact, and since the air was practically excluded during its formation many of the gases that are driven off in making charcoal were changed into substances that combined with the coal. These are com-

pounds of hydrogen and carbon with a few other substances, and their presence in varying proportions gives us the different varieties of coal.

Varieties. Three general varieties of coal are recognized in commerce. The classification is founded on the degree of hardness, and the varieties are *anthracite, bituminous* and *lignite.* Each variety may be subdivided into several sub-varieties, each named for some distinguishing quality or from the locality where it is mined, as *Indiana Black, Lehigh Valley* and *Pocahontas.*

Anthracite. Anthracite is the hardest and best variety. It is often called *stone coal,* because it is so hard and is supposed to have been the first coal formed, since it occurs deep in the earth. It was probably subjected to greater heat than bituminous coal, since it is almost pure carbon. The most extensive anthracite mines are in Eastern Pennsylvania. The veins do not lie as they were formed, for they have been moved by mighty convulsions of the earth; some are near the surface, while others are found at great depths. Anthracite burns with little or no flame and without smoke, and produces intense heat. Its chief uses are for warming dwellings and for manufacturing of water-gas.

Bituminous Coal. Bituminous coal is much softer than anthracite, and contains much more matter that is readily vaporized. It burns with more or less flame and a dense black smoke, the latter caused by the escape of unburned carbon into the air. In many large cities this smoke has become so annoying that ordinances have been passed requiring the use in chimneys of such devices as will prevent the nuisance.

Bituminous coal is widely distributed in the United States and Canada and in nearly all other countries. The great coal fields of Western Pennsylvania, Ohio, West Virginia, Indiana and Illinois all contain it. Canada's largest coal areas are in Alberta; its next largest fields are in Saskatchewan. Bituminous coal from different fields varies in composition. That from one region, as Illinois, is especially suited to one purpose, like the production of steam; that from West Virginia is especially valuable for coke, and so on. Hence we find the names *steam coal, gas coal* and *coke coal* applied to these coals of different composition. Some of the best grades of bituminous coal approach anthracite in hardness and are known as semi-bituminous.

Cannel Coal. This is a variety of bituminous coal which is very compact. It burns like a candle from one end of the lump to the other, hence its name, *cannel* being corrupted from *candle.* Very hard pieces take a good polish, and they are sometimes used for ornaments. Cannel coal is highly prized for burning in open grates, but it is scarce and consequently expensive.

Lignite. Lignite is of a brown color, soft and brittle. It is the most recently-formed coal, and contains more or less earthy matter. It often shows a woody structure, and sometimes branches or twigs are found in it in the form in which they grew. Lignite occurs west of the Mississippi River, where it is mined in North Dakota, Montana, Utah, Wyoming, Colorado and New Mexico. The scarcity of other fuel in these localities makes it of considerable value for warming dwellings. It is not, however, well suited for use in steam boilers or for other manufacturing purposes, because of impurities present which prevent it from producing so intense a heat as anthracite or bituminous coal.

Distribution. Coal is found in all the continents, but the largest areas are in North America and Asia. The fields in Asia, however, are only slightly developed, and the United States, the United Kingdom and Germany pro-

WORLD'S COAL PRODUCTION

The figures represent for each country an average of five years' production.

duce as yet over eighty per cent of all the coal used in the world. The following table gives the estimated area of the coal fields of the world so far as they have been located, and the chart above shows the annual production.

COAL AREAS OF THE UNITED STATES AND CANADA

COUNTRY	AREA IN SQ. MI.
United States	333,000
Canada	70,000
China	200,000
Japan	No data
India	35,000
Russia	27,000
United Kingdom	12,000
Germany	3,600
France	1,800
Austria-Hungary	No data
Australia	Undetermined

United States. The United States produces more coal than any other country. The great coal fields are the Appalachian, the Eastern interior and the Rocky Mountains. The Appalachian field covers an area of over 70,000 square miles and extends from the northern boundary of Pennsylvania in a southwesterly direction to the north-central part of Alabama. The anthracite coal measures are in the eastern part of this field, near its northern extremity. Pennsylvania, West Virginia and portions of Virginia, Ohio, Tennessee, Kentucky and Alabama are included in this field.

The eastern interior field includes parts of Tennessee and Kentucky, Indiana, Illinois and all the other states in which coal is found east of the foothills of the Rocky Mountains. Its area is about 94,000 square miles.

The Rocky Mountain field includes the region extending from the eastern foothills of the Rocky Mountains to the Pacific coast. Its area is about 45,000 square miles. Most of the coal in this field is lignite, though valuable seams of bituminous coal are found in Colorado.

The total area of the coal fields within the

A MILE UNDERGROUND.

Interior of a coal mine at Shenandoah City, Pa., which has been worked for years. The level shown is 5,355 feet below the surface.

OUTLINE AND QUESTIONS ON COAL

Outline

I. Definition

(1) Nearly all carbon
(2) Relation to peat

II. How Coal Was Formed

(1) Decayed vegetation
  (a) Submergence
  (b) Heat and pressure
(2) Repetition of process
  (a) Veins

III. Varieties

(1) Anthracite
  (a) Graded according to size
(2) Bituminous
  (a) Cannel
(3) Lignite

IV. Where Coal Occurs

(1) United States
  (a) Appalachian coal fields
  (b) In Eastern interior
  (c) Rocky Mountains
  (d) Size of fields
  (e) Annual production
(2) Canada
  (a) Size of fields
  (b) Output
(3) Great Britain
(4) Germany
(5) Other countries

V. Methods of Mining

(1) Open quarries
(2) Deep veins
  (a) Shafts
    1. Number
    2. Size
    3. Division into compartments
  (b) Actual mining operations
    1. Galleries and pillars
    2. Loosening the coal
    3. Bringing it to the surface
  (c) Dangers of coal-mining, and remedies

VI. Preparation for Market

(1) Breaking
(2) Screening

Questions

How can man imitate nature's work in making coal?

Where is the largest Canadian coal field? The second largest?

What country in Asia has very large fields, but averages a comparatively small output?

Why are canary birds sometimes kept in coal mines?

What, in comparatively recent years, indicated the importance of the coal-mining industry?

What is the undesirable feature of burning soft coal in closely-built regions?

How many of the Canadian provinces have coal fields?

What is the greatest source of danger to coal-miners?

What is the difference between coal and peat?

What does the name "cannel" coal mean? Why is it appropriate?

If about 1,500,000,000 tons are used each year, how long will the world's estimated coal supply last?

What are the duties of a "breaker boy"?

What causes the difference between "man-made coal" or charcoal, and real coal?

What three countries take the lead in coal-production?

Why do some mines have but one shaft, while others have several?

Describe the process or processes by which coal was formed.

How does lignite differ in looks from other varieties? Why is it not so well suited for manufacturing purposes as these others?

When is "open quarrying" possible?

United States, not including those of Alaska, is about 333,000 square miles. This is equal to the combined areas of Texas and Oklahoma, or the state of New York and five states as large as Illinois, or eight times the area of Ohio.

The present annual output of the United States is a little over a half billion short tons. The leading states in the order of production are—

Pennsylvania	Alabama
West Virginia	Indiana
Illinois	Colorado
Ohio	Virginia
Kentucky	Iowa

Canada. The coal fields of Canada occur in New Brunswick and Nova Scotia and in Saskatchewan, Alberta and British Columbia. The Nova Scotia fields are of great value and have been worked for many years. The fields in Saskatchewan and Alberta are the largest in area and contain lignite and bituminous coal, some of the latter being an excellent cooking coal. The exact area of coal-producing lands in the whole Dominion has not yet been determined.

Other Countries. Great Britain, next to the United States, is the largest producer, followed by Germany. The table shows that most of the leading countries of Europe produce some coal. In Asia production is practically confined to Japan, China and India; in Africa, to Cape Colony, and in South America to Chile. Australia and New Zealand produce as yet only a little more than is needed for home consumption.

Quantity of Coal. Each field contains a number of veins of coal. In the older mines of Pennsylvania and West Virginia a number of these veins have been worked so long that some shafts are 1,500 or more feet deep, and below these veins there are probably others that have not been discovered. It is therefore impossible to estimate accurately the amount of coal in reserve. The most authentic estimate that has been made is that under the direction of the International Geological Congress of 1913, which gave for the world 7,397.553 million tons (7,397,553,000,000), of which 5,105,-528 million tons (5,105,528,000,000) are in the United States. While the mind utterly fails to grasp the significance of these figures, it will be clear that at the present rate of consumption we need not worry about shortness of coal for centuries to come, despite the continued warning of pessimists.

Coal Mining

Coal occurs in veins which lie in a horizontal or an inclined position. Occasionally the veins are near enough to the surface to be stripped of the overlying rock and worked as open quarries. In hilly or mountainous regions the coal may be reached by a tunnel bored into the side of the hill or mountain. Deep veins and those found in level regions are reached by sinking a shaft, and this method is the one most frequently employed.

The Shaft. In America shafts are usually square or oblong. They vary in size and depth. Where the veins are near the surface it is more economical to sink small shafts at short distances from each other than it is to haul the coal from all parts of the mine through tunnels to one shaft. But in deep mines it is less expensive to use one shaft. Deep shafts may be ten feet wide and thirty or more feet long. They are usually divided into compartments; two of these are used for the elevators, or cages, on which the coal is hoisted to the surface and in which the miners are let down and hauled up from the mine; one is for pipes, ladders and pumping apparatus, and one for ventilation, or the same compartment may be used for pipes, ladders and ventilation.

The shaft is lined with timbers, and over the mouth a strong frame, fifty or more feet high, is constructed for holding a part of the hoisting machinery. The cages are raised and lowered by a wire cable which passes over a large wheel at the top of this frame, then around a drum that is operated by a steam engine. There is a cable for each cage and the arrangement is such that as one cage is hoisted the other is lowered.

Mining the Coal. The miners work from the foot of the shaft, following the vein in different directions. First they excavate the coal so as to form a large gallery or passage in one direction. This must be broad enough and high enough for cars to be hauled by mules or by an electric or steam locomotive. As fast as this passage is extended a track for the cars is laid in it. The next step is to excavate other passages at as near right angles to the first as the position of the vein will permit. As the mining proceeds tracks are laid in most of these passageways, all leading to the track in the

main passage. All the coal is taken out except pillars, three or four feet square, which are left at frequent intervals to support the roof. The map of the passages in a coal mine would look like the map of a city's streets, except that the passages in the mine are more irregular and are narrower.

The coal is loosened by hand picks and drills, by machinery and by blasting. Hand tools are now used only when the miner begins a new excavation, and then only so long as is necessary to make an opening in which a machine drill or pick can be placed. These machines are driven by compressed air or electricity and will cut into the coal at from six to twelve inches a minute. One of these machines is a chain-cutter, which has knives attached to the links; the chain moves in either a horizontal or a vertical direction, and as the chain moves over the coal the knives cut a channel. The machine is mounted on a carriage so it can cut into the coal several feet. The miner usually makes his cut as near the bottom of the vein as possible; then he breaks the coal down by blasting with a light charge of powder.

The loosened coal is loaded into cars, which are run into the main track, where in large mines they are joined into trains and hauled to the shaft by small locomotives. In some mines these cars are hauled more than a mile.

Dangers and Remedies. Nearly 3,000 men are annually killed by accidents in the coal mines of the United States alone. For every 177,000 tons of coal mined one man lays down his life. In other countries the hazards of coal mining are about as serious. Nearly half of these deaths result from falls of roofs and coal. To counteract this danger pillars of coal are left in the mine to support the roof. Explosions of gas and coal dust account for about one-fifth of these fatal accidents. The remainder result chiefly from blasting, moving cars and electricity.

The gases which accumulate in coal mines, especially soft-coal mines, are *fire damp,* which is very explosive; *carbon dioxide,* which suffocates those who breathe it; and *carbon oxide,* the white damp of the mines, both poisonous and easily set afire. Gas explosions are generally local and in themselves usually do not cause the sacrifice of much life. They set off, however, the much-dreaded coal-dust explosions. Following an explosion, miners are sometimes suffocated by the formation of carbon dioxide or choke damp. Canary birds have been found very useful in detecting choke damp, since they usually fall from their perches from its effect, before men breathing the same air feel distress. The after-effects on men are very serious.

In recent years there has been a world-wide movement toward studying the causes and the prevention of coal mine explosions. The resources of science and engineering have been drawn upon in devising methods and apparatus for rescuing miners quickly from danger following an explosion. Men wearing helmets and armed with artificial breathing devices enter the death-laden atmosphere below and bring the victims to the surface, where many are revived. The United States Bureau of Mines

A Booklet on Coal

Use three sheets of paper 9 x 12 inches, or larger, and fold once, making twelve pages.

Cover page—*Story of Coal* in center, made in "black diamonds."

Illustrations: At left side—ferns and other vegetation. At lower right side—pile of coal.

Inside cover—Blank.

Page one—Essay, *Origin of Coal*—"Buried Sunshine."

Illustrations: Rank fern vegetation, coal with fern-leaf impression.

Page two—Essay, *Mining of Coal.*

Illustration: At left—shaft connected at bottom with cross-section of mine with miners at work.

Page three—Essay, *Kinds of Coal*—anthracite, semi-anthracite, bituminous, lignite.

Illustration: Lumps of coal of various sizes.

Page four—Essay, *Uses of Coal*—in heating, manufacturing, transportation.

Illustration: Stove, furnace, steel mill, engine.

Page five—Essay, *Coal in My County*—importance, location, development.

Illustration: Outline map with shaded coal fields.

Graphic: Ten leading counties.

Page six—Essay, *Coal in My State or Province.*

Illustration: Map with shaded area.

Graphic: Leading states or provinces.

Page seven—Essay, *Coal in Canada,* or *Coal in the United States.*

Illustration: Shaded map.

Page eight—Original page suggested by teacher.

Inside back cover—Blank.

Back cover—Poem on coal.

has done praiseworthy pioneer work in this field.

Preparation for Market. When anthracite comes from the mine fragments of rock are mixed with it, and it is in larger lumps than are practicable for use. The coal is hoisted to the top of a high building called the *breaker,* where it slides down inclined chutes to the rolls which break it into the various sizes at which it is placed on the market. Boys, on seats placed across these chutes, pick out the fragments of rock as the coal passes along. These boys, called *breaker boys,* become very skilful and will detect rock where an inexperienced person would not see it. After the coal passes through the breakers the sizes are separated by screens. These sizes, in order, from the largest commercial form to the smallest, are *furnace, egg, small egg, stove, nut* and *pea.*

Soft coal is usually run over a screen to clean it of dirt and small fragments, after which it is ready for sale. Some mines, however, wash small sizes, and assort them by screening, placing them on the market as "washed coal," which is a very desirable fuel.

Price. That variety of coal which produces the most heat at the least cost is the cheapest; therefore, the real value of coal depends upon its heating quality. For warming buildings one ton of anthracite is considered equivalent to two tons of the best grades of soft coal. Prices vary with the distances from the centers of production. To illustrate, when anthracite sells west of Ohio for $7.50 to $7.75 per ton, and the best grades of soft coal for about $4 per ton, at or near the mines anthracite may sell for $5.50 to $6 per ton and soft coal for $2 to $2.50. These are pre-war quotations. E.S.

Consult Macfarlane's *The Coal Regions of America;* also bulletins issued by the Bureau of Mines, Washington, D. C.

Related Subjects. The following articles in these volumes will give added information as to coal, its method of formation, and other related topics:

Carbon	Diamond
Carboniferous System	Geology
Charcoal	Mining
Coal Tar	Peat
Conservation	

COALITION, *ko a lish' un,* in domestic or international politics, is a temporary alliance of political parties or nations for a definite purpose but without loss of individual existence. An excellent example in domestic politics is the coalition Ministry formed in Great Britain in 1914, soon after the beginning of the War of the Nations; its Premier was a Liberal, but it included among its members men of all shades of political opinion, all willing to sink their differences in the great need of their country.

In international politics the most important coalitions have been directed against France, first in the days of Louis XIV and later in the Napoleonic era. The great coalition against Louis XIV, known in history as the *Grand Alliance,* comprised England, Spain, Sweden, Holland and all Germany, and had the secret support of the Pope and many of the Italian princes. This coalition came to an end at the Peace of Ryswick (see RYSWICK, TREATY OF).

The first coalition against France in the Napoleonic era was formed by the same countries, with the exception of Sweden, in 1793, and lasted until 1795. The second coalition, formed in 1799, comprised England, Russia, Austria, Naples, Portugal and Turkey. This coalition was broken in 1801 by a treaty of peace between Austria and France, but a third one was formed in 1805 between England, Russia, Austria, Turkey, Sweden and Naples. The fourth coalition is usually called the *Great Coalition;* it included nearly all the nations of Europe and resulted in the final fall of Napoleon in 1815.

COAL OIL is the name given in some localities to KEROSENE. See the article of that name in these volumes.

COAL TAR, or **GAS TAR.** In the manufacture of illuminating gas from bituminous coal, a thick, sticky, dark-colored substance with a disagreeable odor is obtained as a by-product. This is *coal tar,* one of the most useful substances known. It is important in the manufacture of roofing and tar paper, is utilized in making road pavements and enters into the production of a commercial disinfectant. Coal-tar creosote is a preservative of wood. Coal tar contains a large number of substances (at least 155) which can be separated from it and from each other by distillation. Among the most useful are benzene, toluene, naphthalene, anthracene, carbolic acid and creosote. These substances are easily separated from each other because they boil at different temperatures (see DISTILLATION). It is from these substances that the coal-tar, or aniline, dyes are made (see ANILINE).

Before the War of the Nations, which began in 1914, Germany had absolute control of the

world's coal-tar dye industry. Although coal tar was made in all civilized countries and distilled in many, it was only in Germany that the nine chief substances obtained directly by distillation were converted into the 270 derived, or "intermediate," substances, from which in turn the 900 or more different coal-tar dyes then in use were made. About three-fourths of the world's supply of finished dyes was made in Germany. The other fourth was finished in other European countries and in the United States, but from the intermediate substances made in Germany. The outbreak of the war caused great embarrassment to textile manufacturers, not only in the European countries fighting Germany, but also in America, whose supply was cut off by the allies' control of the seas. The result was a great expansion of the coal-tar dye industry in the United States and Canada. J.F.S.

COAST'AL PLAIN, a stretch of lowland extending along a seacoast, and sloping gently toward the floor of the sea, of which it is a continuation. Such a plain represents what in many cases was formerly the bed of the sea, and is composed of material washed down from the mountains by rivers. This material, by a gradual process of accumulation, builds up a plain on the sea floor that grows higher and higher until it becomes a part of the land area of the continent. The action of the waves tends to level the surface, and the plain increases gradually in width as successive portions of the sea floor are raised to the surface. As

A NARROW COASTAL PLAIN

soon as a plain is formed rivers begin to cut channels in its surface, for coastal plains are exposed to the same processes of weathering as mountains and plateaus. Because of the comparatively-level surface, nearness to the sea, fertile soil and navigable rivers, coastal plains usually become prosperous centers of population. Among well-developed coastal plains of the world are those of Eastern North America, the east coast of India along the Bay of Bengal, the coastal slope of Guiana and the plains of Patagonia, east of the Andes Mountains.

The Atlantic Coastal Plain is one of the best examples of this type of plain. It lies along the eastern shore of the North American continent from Canada to Mexico, bordering on the Atlantic Ocean and the Gulf of Mexico. From New York to Georgia it occupies a narrow strip of land between the Atlantic on the east and the foothills of the Appalachian Mountains on the west; below Georgia it broadens out to include Florida. Passing around the southern limits of the Appalachian range in Northern Alabama, it widens out and extends as far north as the Ohio River, while a narrower strip west of the Mississippi River extends southwestward as far as Vera Cruz, Mexico.

The abrupt slope which marks the line along which the older land and the coastal plain merge is known as the "Fall Line" (which see).

COAST AND GEODETIC, *je o det'ik,* **SURVEY,** a bureau of the United States government which had its beginning as far back as 1807, when Congress, at the suggestion of President Jefferson, authorized the establishment of the national coast survey as a bureau under the Secretary of the Treasury. The Coast Survey was actually organized in 1816, and the first field work was done in that year, but little actual work was accomplished before 1832. In 1871 the scope of the bureau was enlarged to furnish geographic positions and other data for state surveys. In 1878 it became the Coast and Geodetic Survey; it was transferred to the Department of Commerce and Labor in 1903, and to the Department of Commerce in 1913.

Work of the Bureau. The Coast and Geodetic Survey operates under two divisions—field and office. The chief function of the field force is charting the coasts of the United States and its island dependencies. Some idea of the magnitude of the task may be gathered from the fact that while the general coast line of the United States and Alaska is 11,500 miles in extent and that of the Philippines, Hawaii, Porto Rico, Guam and Tutuila 5,400 miles, the actual shore line, which includes all the islands, bays, sounds and rivers in the tidal belt, is 103,000 miles—91,000 for the United States and Alaska and 12,000 for the latter group. The topographic work extends only three to four miles from the coast, while the ocean is charted out as far as necessary for

safe navigation. For this work the survey used twelve steamers and a number of launches and employs about 600 men.

The *geodetic* feature relates to spherical surveying, or earth measurement. This includes triangulation, precise leveling and astronomic observations. By triangulation the accurate positions of a large number of stations are obtained, as well as the distances and directions between them. This furnishes the control for all other public surveys, including state and national boundaries, and often for city surveys, as well. From the precise leveling are obtained the accurate elevations of a great many marks referred to mean sea level and these are used by surveyors and engineers for the control of local work.

In connection with the Corps of Engineers of the United States army, the United States Geological Survey and the Pennsylvania and Baltimore & Ohio railroads, the Survey has covered the entire United States, in a general way, with a network of these precise levels. It also studies the features of terrestrial magnetism in different localities, and records tides and tidal currents. In the geography of the ocean it pays attention to the physical characteristics of the ocean—its currents, density, temperature, etc.

In the office of the bureau charts are constructed from original surveys, are engraved and printed and sold for the actual cost of paper and labor. The publications of the bureau consist of 645 different charts, covering all the coasts of the United States and outlying possessions; annual tide tables for all the leading ports in the world; coast pilots, furnishing sailing directions for all navigable waters along the coast; special publications giving geographical positions, precise leveling results and other useful data, in a form suitable for surveyors and engineers; data for magnetic stations, and special reports which give the results of scientific research. E.L.J.

COAST RANGE, a range of mountains in the Western United States and Southwestern Canada, made up of a number of smaller ranges, which contribute largely to the wealth of the country by reason of their valuable mineral products. This range extends almost the entire length of California, across Oregon and into Washington and British Columbia, and forms the southwestern boundary of the great central valley of California; there it consists of a series of great ridges. Between these ridges are long and narrow valleys which, because of a remarkable system of irrigation, are noted for fertility and beauty.

The Coast and Sierra Nevada ranges, which interlock near Mount Shasta on the north and near Fort Tejon on the south, are unsurpassed in the production of mineral products; gold, formerly the chief product, has been superseded by petroleum in respect to value of output. The manufacture of cement and asphalt is of first importance among the mineral industries; silver, copper, zinc, quicksilver and borax are found in the mountain slopes and foothills. Among the best-known summits of the range, which rise to heights of 7,000 or 8,000 feet, are Diablo; Hamilton, the site of the famous Lick Observatory; Loma Prieta and Tamalpais, the latter overlooking the Golden Gate, or San Francisco Bay. See physical map, NORTH AMERICA. A.E.R

COATESVILLE, *kotes'vil,* PA., a city in Chester County, in the southeastern part of the state and on the western branch of Brandywine Creek, thirty-eight miles west of Philadelphia. The Pennsylvania and the Philadelphia & Reading railroads provide railway transportation, and electric lines operate east and west from the city. The place was settled in 1800 and named in honor of Jesse Coates, one of the settlers; it was incorporated in 1867. Among cities of its size Coatesville has high rank as an industrial center; iron and steel works, brass foundries, machine shops, tube mills, silk mills and tobacco, phosphate and automobile factories are the largest industrial plants. In 1910 the population was 11,084; in 1920 it was 14,515. The area of the borough is less than two square miles.

COATICOOK, *ko'ti kook,* a town of Stanstead County, Quebec, on the Coaticook River and the Grand Trunk Railway, twenty miles south of Sherbrooke and 122 miles south of the city of Quebec. It is an important manufacturing center, the principal products being textile goods, chemicals, butter and cheese, flour, shingles and other building materials. In addition to the public schools there are a Roman Catholic convent, a boarding school and a commercial school for boys. Population in 1911, 3,165; in 1921, 3,554.

COAT-OF-ARMS. See HERALDRY.

COBALT, *ko'balt,* a silver-white metal, resembling iron in its physical and chemical properties and still more closely related to nickel (which see). Nickel and cobalt are often found in the same ore. The pure metals are not found in nature. The ores contain the

metals in the combined state—most commonly as sulphides and arsenides. The pure cobalt obtained from such ores is heavier, harder and stronger than iron and does not rust or tarnish. It takes a good polish and, like nickel, can be used for plating other metals. The metal is not in much demand because nickel, which costs less, usually serves the same purpose. The compounds of cobalt are used to a considerable extent as coloring matters. *Cobalt blue, coeruleum, new blue* and *smalt* are blue pigments used by artists, and there are also a *cobalt yellow* and a *cobalt green.* Cobalt oxide is used to color glass and enamels blue.

Cobalt chloride is used as a so-called *sympathetic ink.* If a weak solution of the compound (which is pink) is used to write on rose-colored paper the writing is invisible, but when the paper is gently heated the pink substance turns blue and the writing appears. If a piece of blotting paper or of light calico is dipped into a solution of one part cobalt chloride and ten parts gelatin to 100 parts water, and dried, it will be blue in very dry weather, violet in weather of medium humidity and pink in wet weather, thus serving as a weather indicator. The paper or muslin may be cut in the form of a flower or made into a dress for a doll. Such devices are often miscalled "paper barometers"; they might better be called hygroscopes.

The town of Cobalt, Ontario, 330 miles north of Toronto (see below), takes its name from the fact that the silver ores found there contain much cobalt. Indeed this is now the chief source of the world's supply of cobalt.

COBALT, a town in Ontario, the center of the richest silver-producing district in Canada and probably in the world. It is situated on the lake of the same name, 330 miles north of Toronto and 103 miles north of North Bay, with which it is connected by the Timiskaming & Northern Ontario Railway. An electric railway runs from Cobalt through Haileybury to Liskeard, about thirteen miles north. The mineral wealth of the Cobalt district was discovered in 1903, and the first claims were worked the next year. Silver, nickel, bismuth, copper, lead, zinc and cobalt were all found in remarkably-rich deposits (see COBALT, above). The silver ores carry as much as 3,000 to 4,000 ounces of silver to the short ton. The shipment of silver from Cobalt increased from $136,000 in 1906, the first year of the rush to the mines, to $17,455,000 in 1912, a record for the province and a greater value than the total silver output of the Dominion had ever reached previous to that year.

The town was partly destroyed by fire on June 6, 1912, but was quickly rebuilt. North Cobalt, three miles distant, is also a great silver producer. Population of Cobalt in 1911, 5,638; in 1921, 4,449.

COBB, IRVIN SHREWSBURY (1876-), a newspaper man, author and dramatist, born at Paducah, Kentucky. He received his early training in journalism as shorthand reporter for various papers and as a contributor to humorous weeklies. When nineteen years of age he became editor of the Paducah *News.* In 1904, after several years' newspaper work in various cities of Kentucky, he removed to New York City, where he became a special and humorous writer on the *Evening Sun* and the *New York World.* After the outbreak of the War of the Nations in 1914 he represented the Philadelphia *Saturday Evening Post* as war correspondent in Europe; and in 1915 lectured in all the leading cities of the United States on his experiences at the front. His many contributions to war literature include two books, *Europe Revised* and the *Paths of Glory.* Mr. Cobb has written vaudeville sketches and monologues, as well as several plays, including *The Campaigner, Funabashi* and *Mr. Busybody.* He is also the author of several books, among them *Back Home, Old Judge Priest, From Place to Place,* and *The Abandoned Farmers.*

IRVIN COBB

Cobb's writings have a freshness and an originality which give his readers constant delight. People read what he writes both to be amused and to be informed. An example of his blending of fact and fancy occurs in an essay on *Kentucky,* his native state, written in 1916:

> The state of Kentucky is shaped like a camel lying down. The straw that broke the camel's back was the first time the state went Republican.

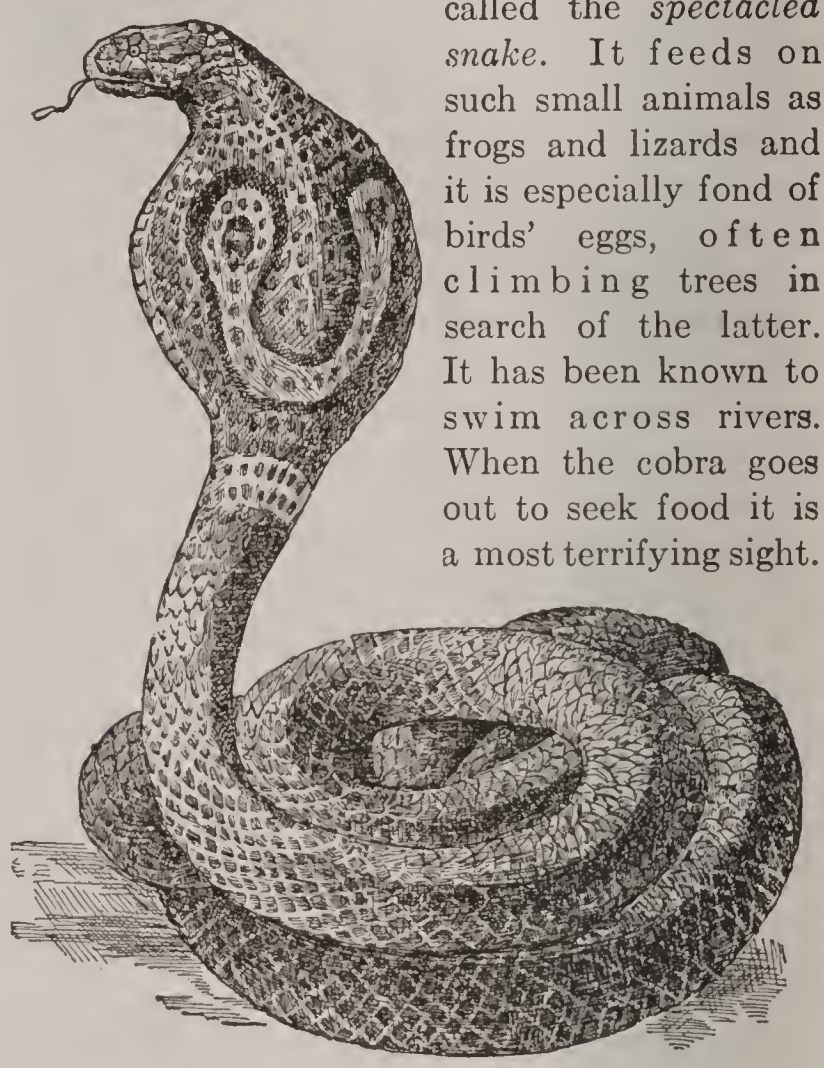
COB'DEN, RICHARD (1804-1865), an English statesman and political economist who is known as the "apostle of free trade." His father was too poor to give him a good education, and at the age of fifteen the boy found work in a

London warehouse. He labored diligently, studied nights and learned everything he could about business, and by 1831 had become one of the partners in a calico-printing establishment. In 1835 Cobden published his epoch-making pamphlet, *England, Ireland and America,* and in 1836 his pamphlet *Russia.* In these he set forth the theory to which he adhered throughout his life, that the foundation of prosperity is free intercourse between the nations. He was one of the earliest English leaders in the movement for free trade, and when he entered Parliament in 1841 he began a crusade against the Corn Laws which resulted in their repeal five years later. During the critical days of the War of Secession in America Cobden was one of a very few Englishmen of note who protested against British recognition of the Confederate States of America as a belligerent nation. See BRIGHT, JOHN; CORN LAWS; FREE TRADE.

COBOURG, *ko'burg,* a county town of Northumberland County, Ontario, on the north shore of Lake Ontario, seventy miles east of Toronto and 100 miles west of Kingston by rail. It is on the Grand Trunk, Canadian Northern and Canadian Pacific railways and has steamship connection with Toronto, Montreal and other ports on the Saint Lawrence River and the Great Lakes. A railroad-car ferry runs between Cobourg and Rochester, N. Y. The town is perhaps best known as a summer resort, particularly for Americans, but it is also a large manufacturing center. Railroad cars, woolen goods, mats and carpets, felt goods, wire-fencing and other steel products and canned fruits and vegetables are important. Shortly after the War of the Nations broke out Cobourg became a large manufacturer of shells for the allies. It has many fine public buildings, including the city hall, built in 1860 at a cost of $200,000, a $50,000 armory and the provincial asylum for the insane, which cost $100,000. From its foundation until 1890 Cobourg was the seat of Victoria University; it is now located at Toronto in affiliation with the University of Toronto. Cobourg was founded in 1818 and was incorporated in 1850. Population in 1911, 5,074; in 1921, 5,327. E.A.D.

COBRA, or **COBRA DE CAPELLO,** *ko'bra de ka pel'o,* a very poisonous hooded snake which infests all India and Ceylon, being found in the Himalaya Mountains at altitudes as great as 8,000 feet. A related hooded snake, not quite so dangerous, is found in most parts of Africa. The king cobra, about twice the size of the true cobra and very venomous, is also found in all parts of India, and is said to eat only snakes.

The full-grown cobra is nearly six feet in length and has a girth of about six inches. In color it is yellowish to dark brown, with a large black and white spectacle mark on the back of its head, from which it is sometimes called the *spectacled snake.* It feeds on such small animals as frogs and lizards and it is especially fond of birds' eggs, often climbing trees in search of the latter. It has been known to swim across rivers. When the cobra goes out to seek food it is a most terrifying sight.



THE COBRA

The deadly serpent glides along the ground with the upper third of its body erect, its hood puffed out and its eyes glaring. It hisses loudly when it prepares to strike.

The bite of the cobra will cause death in a few minutes, and there is no known antidote for it; however, prompt amputation or cauterizing will sometimes save life. As it is found everywhere in fields and jungles and even enters huts, it is estimated that from 15,000 to 20,000 natives, as well as thousands of cattle, perish every year from its bite. Perhaps there would not be so many of these reptiles if the natives were not too superstitious to kill them. The cobra is very revengeful, and it is said will pursue anyone who injures it until it kills him.

The jugglers and snake charmers of India usually select the cobra for exhibition purposes, carrying the hideous creatures around the country in baskets and making them perform at the sound of the flute; and it is not unusual to see one of these snake charmers trudging down a dusty road in India with half

a dozen wriggling, hissing serpents around the upper part of his body. It is said that the fangs of the snake are extracted, but this is not always the case. For explanation of this curious fact, see SERPENT CHARMING.

COB'WEBS, the irregular webs spun in neglected corners by certain types of spiders. See SPIDERWEBS; SPIDER.

COCAINE, *ko'ka in,* also *ko kane',* a bitter drug prepared from coca leaves. It is used by dentists to deaden pain and by oculists to dilate the pupil of the eye. Within recent years it has also been successfully employed in surgical operations. When it is injected into the spinal canal the entire body below the point of injection becomes insensible to pain. To be effective cocaine must come in contact with mucous surfaces or be injected beneath the skin.

It has a quieting, restful influence which has led to a widespread and dangerous habit, for its continued use causes sleeplessness, nervous twitching, mental and moral weakness and certain death. Its presence in some patent medicines has in many cases started this deadly habit. A "coke fiend" will lie, beg, steal or do anything to obtain this drug. In 1914, when the Harrison act prohibited the sale of cocaine in the United States except under a physician's prescription, many habitual users were nearly crazed for want of it. As a result benevolent societies were kept busy trying to furnish relief to the victims and to bring them back to a normal moral and physical state.

Coca, the shrub from whose rusty leaves cocaine is made, is native in South America but is now also cultivated in Ceylon, India and Java. It grows from three to six feet high and bears yellow flowers. The South American Indians, especially in Peru and Brazil, chew as a stimulant the dried leaves mixed with finely-powdered chalk. A small quantity will enable a person to resist fatigue and for a time to need less food, and it makes breathing easier in mountain climbing; but the reaction is always depressing. This habit, like the use of the drug, is also detrimental. J.H.K.

COCCUS, *kahk'kus.* See SCALE INSECT.

COCHIN-CHINA, *ko cheen',* or *ko'chin,* a name which once applied to the entire empire of Annam, but is now confined to the French colony of that name, lying in the extreme southern part of French Indo-China. It was formerly Lower Cochin-China. It consists for the most part of a vast alluvial plain formed by the deltas of the Mekong, Saigon and other rivers, but in the east there is a small hilly area with an altiude of 1,500 to 2,900 feet.

The country has an area of 22,000 square miles—more than one-tenth that of France, and about that of West Virginia. About one-fourth is under cultivation, the remainder being covered with dense forests. The soil

LOCATION MAP

is very fertile, and the low wet lands produce vast quantities of rice, which is the chief product. Cocoanut palms, areca nuts, bamboo, tobacco, sugar cane, maize and cotton are also grown. The wild animals include the panther, tiger and elephant and many serpents. The beast of burden is the water buffalo. Large numbers of poultry, swine and ducks are raised. The first, an excellent breed, probably has given its name to the Cochin-China fowls so well known in America. There is no harbor on the seacoast, but Saigon on the Saigon River and Mitho on the Mekong are reached by the largest vessels. The population was 3,452,248 in 1919, fewer than 8,000 of whom are Europeans; in religion more than half are Buddhists.

COCHINEAL, *kahch'i neel,* a natural dyestuff used for the production of crimson and scarlet tints and for the preparation of carmine and lake. It consists originally of the bodies of minute cochineal insects, which are found feeding upon various species of cacti, more especially the nopal plant, a native of Mexico and Peru. The insects are brushed from the branches of the cactus into bags and then killed by immersion in hot water or by exposure to the sun, steam or heat of an oven. The dried insects have the form of irregular fluted and concave grains, of which about 70,000 weigh only a pound. They are collected three times during the growing season.

The dye is prepared from the dried bodies of the female insects, which are placed in a vessel with ammonia water. This vessel is then placed in boiling water, uncovered, which causes part of the ammonia to evaporate. The

residue, or what remains, dries slowly and is known as "cochineal paste." It is then ready for use in dyeing.

There are two principal varieties, *silver* cochineal, which has a grayish-red color, and *black* cochineal, which is of a dark, reddish-brown. The dye was introduced into Europe from Mexico and is now furnished not only by Mexico and Peru, but also by Algiers and Southern Spain.

COCHRANE, *cock'ran,* a town in the Timiskaming district, Ontario, 480 miles north of Toronto, 750 miles southeast of Winnipeg and 550 miles west of Quebec. It is the northern terminus of the Timiskaming & Northern Ontario Railway, and is the most important point between Winnipeg and Quebec on the National Transcontinental Railway. Both of these railroads here maintain roundhouses and repair shops. The district tributary to Cochrane, which has been open to settlement and development for only a few years, includes the Porcupine gold fields, nickel and iron mines and a rich lumbering section. The town is the natural outfitting point for prospectors, miners and lumbermen and for sportsmen who visit the region to hunt or fish. Cochrane was founded in 1908, and was named for Hon. Francis Cochrane, at that time minister of lands and mines for Ontario. The town site was surveyed by the Timiskaming & Northern Ontario Railway Commission, which received from the Ontario government the right to sell or otherwise dispose of the land. Population in 1911, 1,715; in 1921, 3,306.

COCHRANE, Francis (1852-), a Canadian merchant and legislator who became Dominion Minister of Railways and Canals in 1911. He was born in Clarenceville, Que., and received his schooling at the academy there. As a young man he removed to Sudbury, Ont., where he acquired important business interests, particularly in lumbering and mining. Becoming active in politics, he first served several terms as mayor of Sudbury, and then from 1905 to 1911 sat in the provincial assembly. From 1908 to 1911 he was also provincial minister of lands and mines in the Cabinet of Sir James P. Whitney. In 1911 he was elected to the House of Commons and entered on his duties as Minister of Railways and Canals.

COCKATOO', a climbing bird of the parrot family, the sulphur-crested species of which is an object of interest in zoölogical gardens. The cockatoos are natives of the East Indies and Australia, but are found in captivity elsewhere, especially in Europe, for they can be tamed easily. Unlike the parrots, however, they can be taught only a few words. Their cry is harsh and unmusical and its sound suggested the name. Cockatoos have large, hard bills, highly curved; long wings and long, broad and usually rounded tails. They can raise or

THE COCKATOO

lower their crests and expand them like fans at will. Most cockatoos have whitish plumage, but some are tinged with red, orange, yellow and other colors. A black cockatoo, the largest of this family of birds, is a native of Northern Australia.

COCK'CHAFER, a clumsy brown beetle, remarkable for the fact that as a destructive white grub it exists three years in the ground; during this time it feeds upon the roots of grass and stalks of corn. When at the end of the period of growth the grubs become beetles, they fly and feed at night, often doing much harm to the leaves of fruit trees. Because they come from the ground in late May and early June, they are also called *May bugs, May beetles* or *June bugs.* Where cockchafer grubs are numerous, the plowing of the ground in September will destroy one brood. Turning hogs, chickens and turkeys loose on the plowed ground will assure the destruction of the younger grubs.

COCK'FIGHTING, a cruel sport which consists of pitting game-cocks against each other and permitting them to fight to the death. This amusement originated in the Far East, is mentioned in the earliest Chinese records

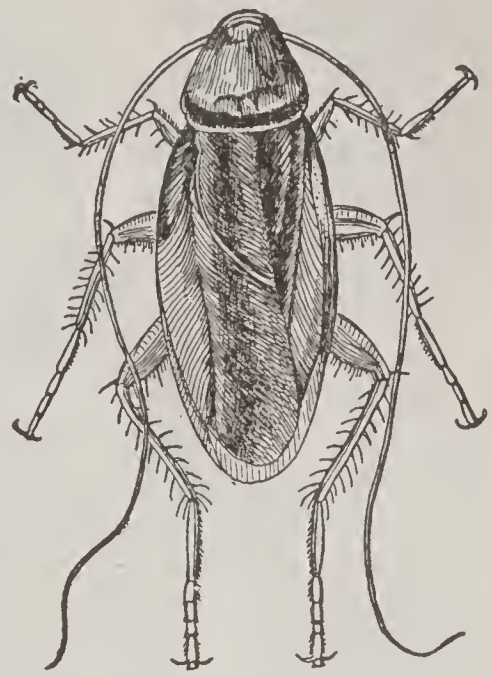
and was also a source of enjoyment to the ancient Greeks and Romans. From Rome it spread to the various countries of Northern and Central Europe, and was later introduced into America. The training and breeding of cocks for fighting became an important industry in Great Britain a hundred years ago, and large sums were wagered on the results of the battles. Cockfighting is now a legal pastime only in the Orient and in Spain or in countries of Spanish origin. Elsewhere humane laws have abolished this so-called sport, though it is yet secretly carried on in a few localities in the Southern and Western United States.

COCKLEBUR, *kock''l bur,* or **CLOT'BUR,** a weed with a method of distributing its seed which is troublesome to man and the lower animals. Three species are known in temperate North America. The burs, or seed-pods, are hard and are covered with sharply-hooked prickles. These stick to the clothing or to the hair of cattle. In pastures or ranges where cattle or sheep feed, this coarse-looking weed is a great nuisance. It is difficult to get the burs out of the wool of the sheep after they once are imbedded there, and efforts are constantly made to exterminate the weed in wool-raising districts. The plant dies, root and all, every year, so it is not difficult to eradicate, if destroyed before the seed ripens. The cocklebur, which belongs to the Composite Family of plants—the same family as the dandelion—was probably introduced into America from England.

COCK OF THE ROCK, a handsome South American bird, with rich orange plumage and a prominent flat-sided crest. The bird is so named because it builds its nest of mud on the rocks. These birds dwell along the rocky streams and on bushy hillsides in the lower Amazon Valley. The males gather together during the mating season and woo the females by dances and other peculiar antics. As the plumage of the birds is much sought for the millinery trade and by Indians for decorative purposes, the cock of the rock is becoming rare.

COCK OF THE ROCK

COCKROACH, *kock'roach,* a very troublesome and exceedingly disagreeable insect pest. Scientifically it belongs to a family of insects which includes the grasshopper, locust and cricket. These creatures have flat, long bodies, furnished with slender antennae, or feelers. Their backs look as though made of shiny black or brownish-black leather. They infest dwellings and other places where food supplies are kept, particularly bakeries, restaurants and groceries, and hide in every crevice they can find. These troublesome pests are seldom seen in the daytime, but when the lights are out at night they emerge in droves from their hiding-places in search of food, swarming over and contaminating everything that is explored. They enter houses by way of pipes for steam and water, or are carried in.



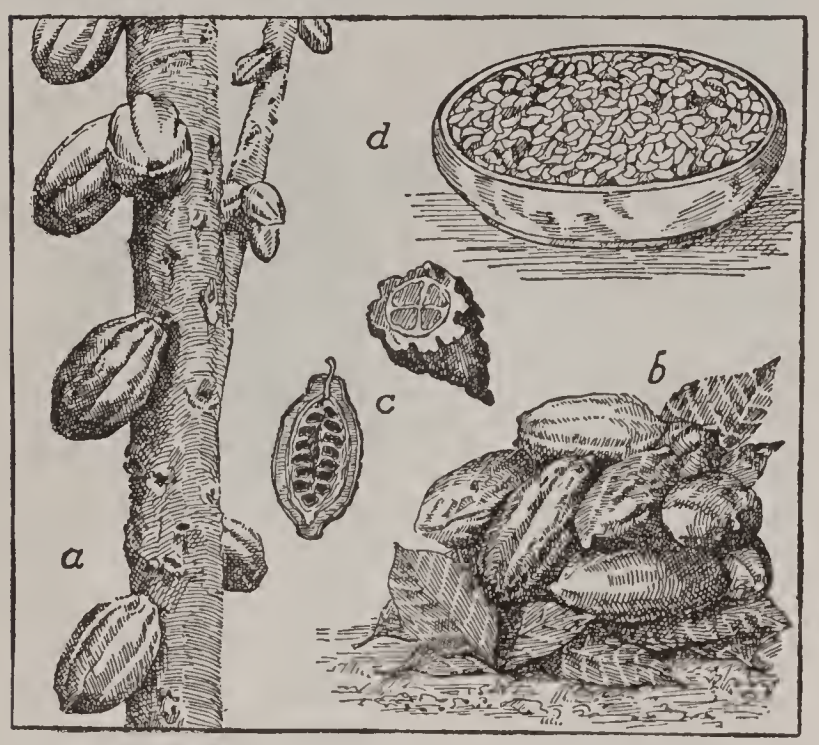
COCKROACH

Natural size of the species in warm climates, as the Southern United States. The cockroach of cooler zones is about one-half as large.

Cockroaches are very prolific, and a few will soon breed until a house is overrun. The creatures can be destroyed by insect powders or by pouring boiling water into the crevices from which they emerge. An English plan is to put some molasses on a board and set it afloat in a basin of water. The insects will be so anxious to get the food that many will drown trying to reach it. There are said to be about 1,000 species of cockroaches.

COCKSCOMB, *kocks'kohmb,* an odd-appearing, easily-cultivated plant, bearing brilliant flowers, which in some varieties take a frilled, crested form like the cock's comb. In light, rich, moist soil, it will bloom from midsummer until frost. The cockscomb is very popular as a border plant, with its colored, long-stemmed leaves and gay flowers. Cockscombs range through all the lovely shades of red and yellow; some of the flowers are stiff crests, while other varieties are waving and graceful, like ostrich feathers. While a native of the tropical regions of America, Asia and the East Indies, the cockscomb is now found throughout the United States.

COCOA, *ko'ko,* originally *ko ko'a,* is a reddish-brown powder obtained by grinding the kernels from the seeds of the cacao, or cocoa, tree. It is widely used in making the popular table beverage known as cocoa. The name,



COCOA

(*a*) How the pods grow on the tree; (*b*) pods with the shells removed; (*c*) longitudinal and cross-sections of pod; (*d*) beans removed from pod.

now in general use in English-speaking countries, is a corruption of the more correct form, *cacao.*

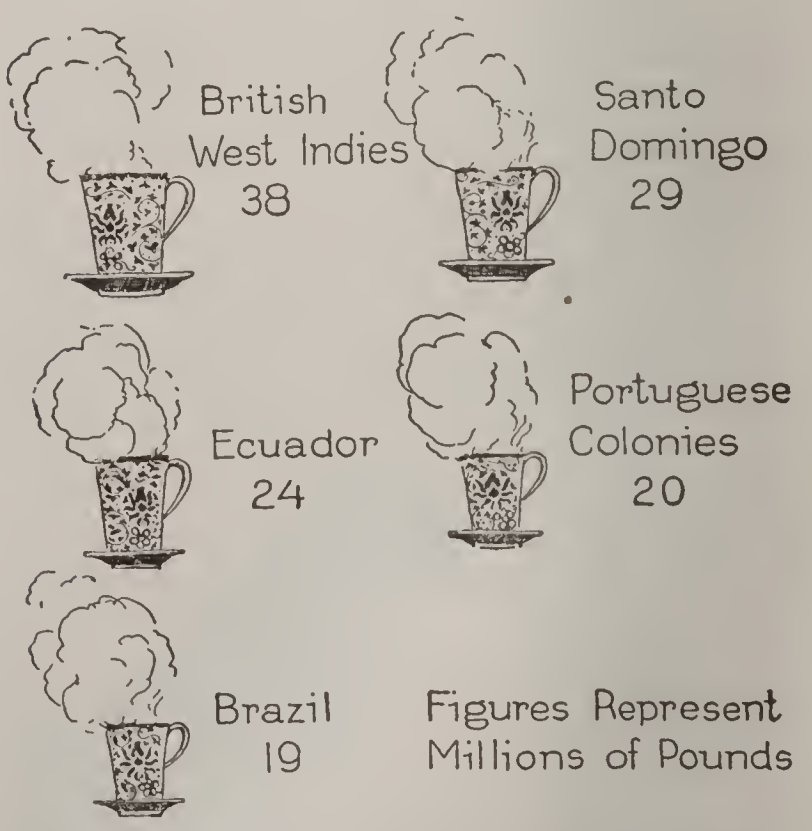
The Tree. The cocoa is a small tropical tree cultivated extensively in Ecuador, Venezuela, Brazil, Saint Thomas Island (off the West African coast), Ceylon, the West Indies and Central America. Heat, moisture, and a deep, rich soil are the conditions which favor its growth. The straight, regular trunk usually attains a height of twenty feet, and puts forth branches which bear shining, oval leaves, dark green above and red underneath.

The flowers, which have five narrow, bright-red petals, grow directly from the trunk or the older branches, and are almost stemless; the fruit, a cucumber-shaped pod with a thick, deeply-grooved rind, has the same peculiarity, as may be seen in the accompanying picture. Each pod contains many almondlike seeds, covered by a thin, reddish-brown shell, and within each of the seeds is a dark brown kernel, the valuable portion of the plant. The seeds have the commercial name of *cocoa beans,* while the kernels are called *nibs.*

Preparing for Shipment. Much of the work of getting the beans ready for shipment is done by negroes. After the pod is picked, a slit is made in the side with a knife; the pods are then broken open with the hand, and the beans and their enveloping pulp are scooped out and carried to a sweating house to go through a process of fermenting. This fermentation makes the pulp easily removable, and also improves the quality of the kernel.

From the sweating house the beans are taken to sieves or troughs and stirred under water until they are clean and smooth. They are then dried, either in the sun or by artificial heat. Finally, in order that the beans may be protected against mold and fungous growths, they are finished, or polished. On some plantations the polishing is done by coolies, who dance upon the seeds until every particle of pulp is removed and the finished product shines. The beans are then placed in bags or barrels and shipped to the different ports of the world, to be sold to the manufacturer.

Manufacture of Cocoa Products. Powdered cocoa, chocolate (which see) and cocoa butter are the chief products of the cocoa beans. In the process of manufacture the seeds are roasted and the shells removed, and the kernels, or nibs, are placed in a grinding mill with steam-heated rollers. Because of the heat the cocoa mass flows out of the mill in a semi-liquid state and can be run into deep pans and allowed to harden. If cocoa is to be made. the mass is remelted and placed in a great press which extracts a large proportion of the



WHERE RAW COCOA COMES FROM

The above comparisons indicate the sources of the cocoa imported yearly by the United States.

fat. The substance is then taken from the press and reduced to a fine powder in a mill consisting of a pair of rollers armed with teeth. Before it is placed on the market the powder is pulverized in a second mill, then is subjected to a thorough sifting.

Chocolate is the cocoa mass with the fat left in. If sugar and flavoring are added, the product becomes *sweet chocolate.* The fat extracted from the cocoa is sold under the name of *cocoa butter,* and is used as a basis for creams and pomades for the hair and skin and in candy making. The shells of the cocoa beans, usually regarded as a waste product, are sometimes roasted with coffee to add to its flavor, and in some sections peasants use them as a substitute for tea and coffee.

Food Value. The cocoa bean yields a valuable food product, whether in the form of chocolate or of commercial cocoa. When used in moderation the beverage made from either of these substances is agreeable and nutritious, and superior to both tea and coffee, for the latter are excitants and are without food value. Cocoa and chocolate contain an alkaloid which is an excitant, and most people should not indulge too generously in these beverages. Some people will be made wakeful at night by even a single cup of strong cocoa drunk during the evening. Too free indulgence in chocolate drinks at soda water fountains, and the excessive eating of chocolate candy will prove harmful, partly because of the effect of the excitant, caffeine. B.M.W.

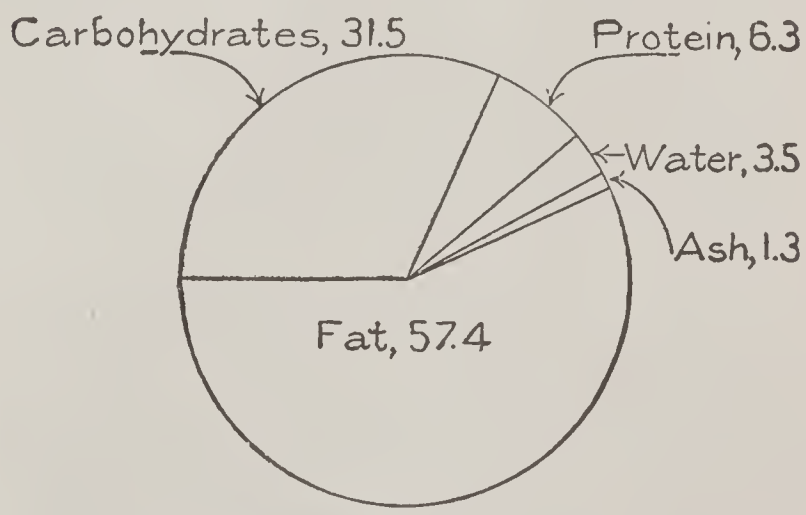
COCOANUT, or **COCONUT,** *ko'ko nut,* the oval, hard, brown-shelled, three-eyed fruit of a tropical palm tree. Its thick, stringy husk, surrounding the firm, white, fleshy, hollow kernel, with its sweet whitish *milk,* is familiar everywhere, either in its natural state or in shredded form, as used in pastries. Boys and girls like to break the thick, hairy shells of the nuts and eat the sweet, white interior and drink its cool "milk," but the principal use to which the kernel is put is for pies, puddings and candies, after it has been chopped into fine pieces, or shredded. Perhaps few know its life history and are aware that the tree is one of the most useful in the world.

The Cocoanut's Story. Ages and ages ago, a tall straight palm grew near a tropical ocean. Its naked trunk, about sixty feet high, was topped with a crown of featherlike leaves, among which hung a cluster of a dozen or more nuts. One day possibly a monkey climbed up to look for food and shook down a few ripe nuts which, falling into the water, floated away. Washed to the shore at spots here and there, they sent forth roots and stems from their three black eyes, and so new trees grew. And now along the Indian coasts and on the South Sea Islands grow thousands of these trees, and because of their many uses they have been extensively planted in Africa and South America—in fact, almost everywhere in tropical countries, principally near the seashore. Cocoa-

COCOANUT
Tree and fruit, and the method of gathering.

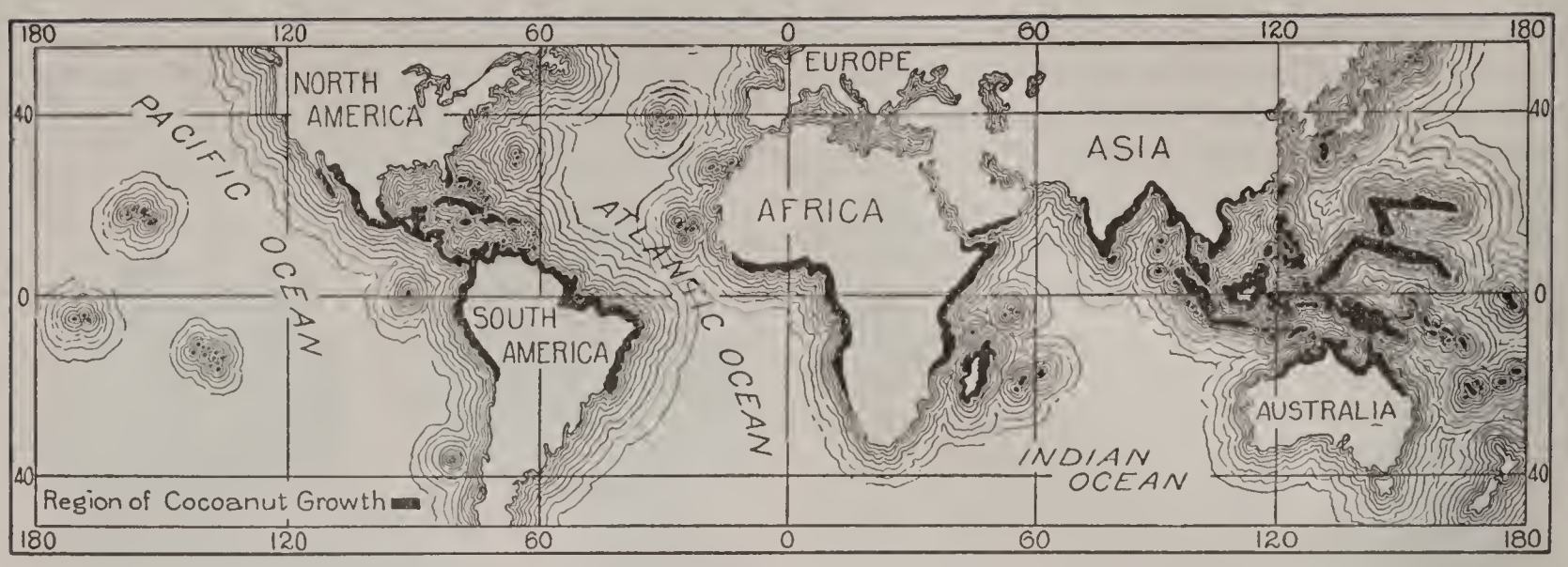
nuts furnish a cooling drink to natives of the countries where they grow. The refreshing milky sap is obtained by cutting through two or all of the fruit's eyes.

Cocoanut Palm Products. To the natives of the countries where this tree grows, the cocoanut is an important article of food. The fruit is eaten ripe or green; the cabbagelike bud at the top of the tree is boiled and eaten. Palm



FOOD VALUE OF COCOANUT

wine is made from the sap, which when distilled produces a very strong liquor called *arrack.* The cocoanut oil or butter of commerce is pressed from the fruit, to be used in making *marine* soap and *stearin* candles and for numerous other purposes. The leaves are used for forage and to thatch cottages. From their fibers cordage, baskets, sacks and other useful



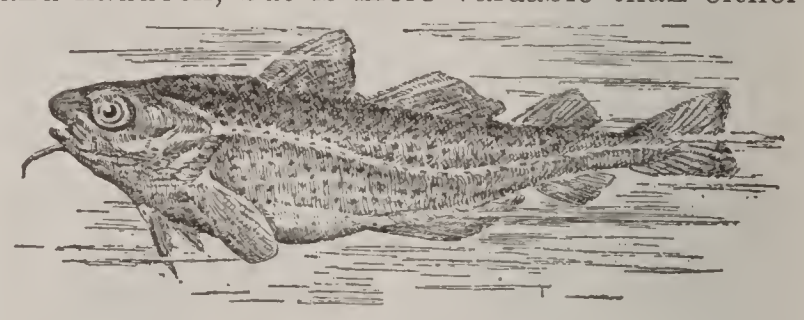
REGIONS FROM WHICH OUR COCOANUTS COME

articles are made. The mid-rib of the leaves is used by natives for spears, arrows and torches. Many of the mats on which we wipe our feet are made of cocoanut fiber. From the shells are made beautiful cups, ladles and other ornamental utensils. The wood of the lower part of the tree takes a beautiful polish and is used for boats and houses. About $2,000,000 worth of cocoanuts and their products are imported into America every year. M.S.

COCOON, *ko koon'*. Most boys and girls have tried the experiment of imprisoning caterpillars in a box in order to watch the wonderful change from worm to fluttering moth or gorgeous butterfly. In many cases they have seen a caterpillar wind about itself a casing formed of thread which it draws out of its head. This casing is the *cocoon.* It is a firm shell completely covering the insect, which lies quietly in it during the time it is casting off its old skin and preparing for its new life in the air. Not all species of caterpillar spin cocoons, but there is one which, because of this habit, is the most valuable insect known. This is the *silkworm* (which see), from whose yellow or white cocoon is unwound the material for all our silk.

Though there are undomesticated silkworms in America, and their cocoons may be found hanging hammocklike close to the under side of small branches or carefully concealed within a folded leaf, the cocoon-spinner which children know best is the fuzzy, furry, brown and black caterpillar which curls up when touched. If one of these interesting little creatures is put in a box in the fall it should be kept in the open air all winter, for its natural process of development is to sleep through the cold weather and build its cocoon in the late spring. When its winter's nap is over it will wind itself about with threads of silk, weaving its head back and forth until its whole body is hidden in a coarse coat of mingled silk and hair. Strange to say, the completed cocoon is much smaller than the caterpillar before it starts its work. In a few weeks the end is broken open and the moth crawls out, looking at first like a dilapidated worm but soon unfolding its patterned wings and showing itself a fully-developed insect. See BUTTERFLY; MOTH.

COD, one of the world's most important food fishes, common to both shores of the North Atlantic Ocean, as far south as France and Virginia. It is a near relative of the hake and haddock, but is more valuable than either



THE COD

of these. The cod fisheries along the Grand Banks of Newfoundland and the shores of New England are famous. The prosperity of Newfoundland, one of Great Britain's oldest colonies, depended for many years solely on cod fishing, and the flesh of the fish was salted and used in trade like money. The importance of the cod in the early history of the United States is shown in the fact that it had a place on the seal of Massachusetts Colony, and to-day a gilded codfish hangs in the state house of representatives opposite the Speaker's desk, between two central columns. The abundance of the fish along the eastern shores of America was noted by the early voyagers and recorded in the stories of their travels.

Description. The cod has a slightly-flattened body, which tapers abruptly to the tail, and is usually greenish or olive on the back and sides, which are dotted with numerous small

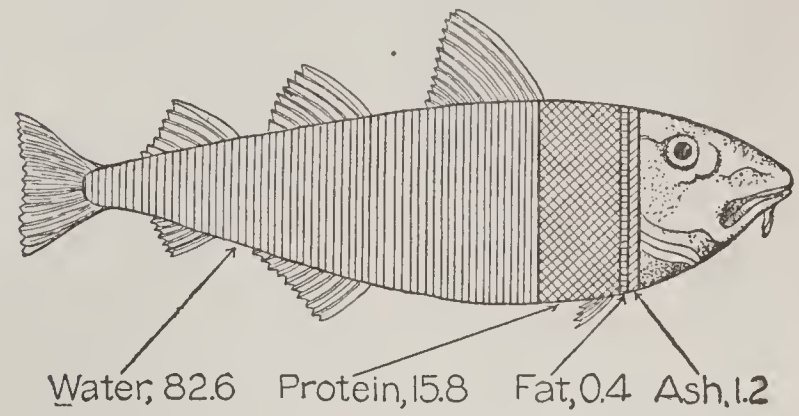
brown spots. The larger fish weigh from twenty to thirty-five pounds; the smaller, about twelve pounds. However, some extraordinary specimens have been caught; the largest ever captured off the New England coast weighed 211½ pounds and was over six feet long, and there are stories of others which weighed from 100 to 175 pounds.

Judging from the things found in the stomach of captured fish, such as scissors, oil-cans, rings, rocks, potato parings, corn-cobs, rubber and leather, the cod will eat anything. Its more natural diet consists of crustaceans (lobsters, shrimps, crabs, etc.), mollusks, small fishes and various forms of sea vegetation. The fish spawn along the northern coasts of Europe in February, March and April; the spawning period on the American coast lasts from November to April. The number of eggs produced by the cod is astonishing; and if all of them from a seventy-five pound fish during its life should hatch and grow to maturity the ocean would be filled with an almost solid mass of cod. A cod weighing twenty-one pounds will produce 2,700,000 eggs in one spawning period; these are so small that it takes 337,000 to fill a quart pail. Because large numbers of eggs are destroyed before they hatch and millions are eaten by other fishes cod do not multiply so rapidly as might be assumed; in fact, artificial propagation is often necessary, and this is one of the most important labors of the fish commissions of the United States and Canada.

The Fisheries. The chief cod fisheries of the world are those of Norway and Sweden, Great Britain, France, Canada, Newfoundland and the United States. The value of the annual catch for the United States averages about $3,500,000; that for Canada, about $8,368,000. American fishermen usually go to the Grand Banks of Newfoundland (ridges in the ocean where the water is only a few hundred feet in depth), and to the Georges' Banks, off Cape Cod. Nearly all of the 600 or more ships of the United States cod-fishing fleet hail from Gloucester, Mass., the headquarters of the industry.

The fishermen start out in swift little schooners, which have attached to them two or three small row boats, called dories. When the fishing grounds are reached they set their trawls, which are long lines anchored at both ends and held up by buoys. To these trawls smaller lines with baited hooks are fastened every few yards. A few hours later some of the men visit the trawls in the dories and remove the cod which have been caught on the hooks; they then carry the catch back to the schooner, and when the vessel has received a load it returns to port.

Codfish is usually sold salted and dried. Cod-liver oil, obtained from the liver of the fish, is taken by persons who are ill-nourished and need building up. About 30,000,000 pounds of dried codfish are prepared each year in the



FOOD VALUE OF FRESH COD

United States, but the export trade is for the most part carried on by Norway, Newfoundland and Canada. The chief markets of the world are France, Spain, Portugal, Italy and Brazil. See FISH, subtitle *Deep-sea Fisheries;* also subhead *Fish Culture.*

CODE, *kode,* **NAPOLEON,** the French civil code of laws compiled under the direction of Napoleon I and largely a reënactment of the Justinian Code, or systematized body of Roman law. Properly, it is the entire body of French law as contained in the Five Codes promulgated between 1804 and 1810. The term is especially applied to the first of these codes, established by Napoleon as a result of the labors, under his direction, of eminent French jurists. The great merit of the code is its simplicity, but in spite of this it has aroused controversies and there has been considerable legislative amendment. To Americans interest in the Napoleonic code lies in the fact that it is the foundation of the code of the state of Louisiana, which was French in its early period. Every other state in the United States bases its laws upon the Roman code. See CIVIL LAW; JUSTINIAN.

CODE WRITING, a method of writing a message so that none but those possessed of the key may decipher its meaning. It is of ancient origin, and its study has been one of great interest in all ages. It requires ingenuity to conceal the meaning of a written message, but it has been said that, no matter how ingenious a code or cipher may be, someone with sufficient ingenuity will be found to decipher it. Julius Caesar used one of the simplest forms

of code by employing the third letter ahead of the one he wished to indicate. Thus instead of writing *a* he would write *d,* instead of *m* he would write *p,* and so on. In using the word *man,* for instance, he would write it *pdq.* References to code writing only to be understood by the initiated appear frequently in the Bible. Jeremiah, referring to Babylon, wrote the word *sheshak;* instead of using the second and twelfth letters from the beginning of the Hebrew alphabet he wrote the second and twelfth from the end.

Charles I constantly employed a code in writing to his adherents, and numbers of his letters fell into the hands of his enemies at the Battle of Naseby. At the present time codes are largely used in diplomatic circles and in business, when it is desired to keep transactions secret or to make one word stand for several in order to save expense in telegraphing or cabling. The great telegraph companies have compiled codes, and copies of these in book form are placed at the disposal of any user of their service.

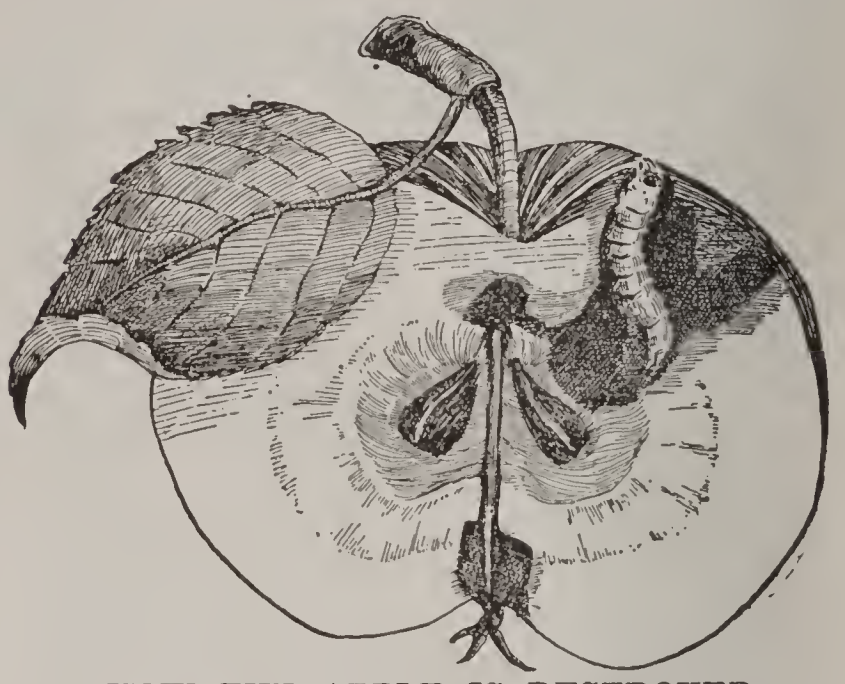
COD'LING MOTH, the little gray-brown moth-parent of the pinkish-white apple worm, which costs the fruit-growers of America about $10,000,000 a year. Seeing one of these moths in the sunshine, with wings sending forth lovely

LARVA OF CODLING MOTH

golden glints, a person finds it difficult to realize that this attractive creature actually produces the creepy worm found in the heart of an apple, or that such a seemingly harmless insect could ruin the apple crop.

The mother moth flits from flower to flower on the apple tree and leaves a tiny yellow egg in the calyx of each. Later, when the flower has fallen and the tiny apple has started to grow, the grub comes forth and eats its way to the inside. When the larva (young) is fully grown it bores through the apple, which has by that time perhaps fallen to the ground. It finds a sheltered place and spins its cocoon. Usually the moth appears a few weeks later, and a second brood of grubs attacks the late crop of apples.

The best remedy for this destructive pest is a thorough spraying with some solution of arsenic, preferably arsenate of lead with lime-sulphur, just after the blossoms have fallen, and



HOW THE APPLE IS DESTROYED

again about three weeks later. Fallen apples should also be destroyed to kill the larvae, and the orchard should be kept clear of rubbish which may hold cocoons.

COD-LIVER OIL, a substance obtained from the livers of the cod and allied fishes. It is used for two purposes—medicinally and for tanning leather. Until recent years it was produced by putting the fish livers into barrels and letting them putrefy, when the oil which rose to the surface was skimmed off. This was of two qualities—the "pale" oil and the "light brown" oil; these are the oils used in pharmacy. The residue was boiled and the ill-smelling black product was the "brown" oil of commerce. At the present time these oils are made from clean, fresh livers by a sanitary steam process, though the product is not much improved in taste. Cod-liver oil has medicinal properties; for many years it has been a favorite home remedy in all wasting diseases, especially pulmonary consumption, though it is really not more nourishing than cream and many other fats. Norway produces the finest oil, but it is also prepared in the United States, Canada and Russia. See Cod.

CODRUS, *kod'rus,* in the legends of ancient Greece, the last king of Athens. When the Dorians invaded Attica Codrus was told by an oracle that his country would be saved if the Athenian king were struck down by the hand of the enemy. He therefore entered the Dorian camp disguised as a peasant, and, provoking a quarrel, was slain. The enemy then withdrew, and the grateful Athenians, esteeming no one worthy to succeed their king who

had sacrificed himself for them, gave to the son of Codrus the title of *archon* and abolished the royal office. See ARCHON.

CODY, *ko'di,* WILLIAM FREDERICK (1846-1917), the BUFFALO BILL of the great plains in the pioneer days of the West in the United States, and organizer in his old age of the "Wild West Show," with which he toured America and Europe. With its bands of Indians, cowboys, rough riders, "bucking bronchos," "Deadwood Coach" and buffaloes, the famous exhibition portrayed much of the actual early life on the plains. Cody was born in Scott County, Iowa. As an express rider during his early life on the Western frontier he gained a reputation as a keen, fearless rider and plainsman. During the War of Secession he rendered valuable services as a Union scout, and he was the last of the six great scouts of America, the others being Boone, Carson, Crockett, Bridger and "Wild Bill." The name *Buffalo Bill* was given Cody during the construction of the Union Pacific Railroad, for he contracted to supply fresh buffalo meat to the troops and laborers there, and killed over 4,000 buffalo in eighteen months. In collaboration with others he wrote *The Great Salt Lake Trail.*

COEDUCATION, *ko ed u ka'shun.* Public schools were first established for boys only, and the education of girls under public auspices was given little or no attention. When society awakened to the realization of the necessity for educating the girls there were no schools for them, so both boys and girls attended the same elementary schools. Later in Germany, France and England separate elementary schools were established for the sexes.

Necessity compelled the early colonists in America to send boys and girls to the same schools, and the system of coeducation early established has continued to the present time; excepting in New York, Boston and a few other Eastern cities, boys and girls attend the same elementary schools throughout the country. But the case is different respecting private schools. About one-half of these institutions are coeducational; the remainder are for boys or for girls.

In Secondary Schools. Coeducation is practically universal in the public high schools, with the exceptions noted above. While practically no objections have been raised to the attendance of boys and girls upon the same elementary schools, some educators seriously object to continuing this plan in the high school. Their arguments embrace the following theories:

(1) During the adolescent period coeducation prevents the development of certain of the finest feminine qualities in the girl and certain masculine qualities in the boy—which are essential to the highest development of manhood and womanhood.

(2) At this period boys and girls should pursue somewhat different courses of study, because of their different aptitudes and because their life work will be different after they leave school.

(3) That girls are not so strong as boys, and subjecting them to the same strain in school work is liable to cause the girls to injure their health by overwork.

(4) The presence of boys and girls in the same classes during early adolescence is apt to be distracting to both sexes, and is liable to awaken sex feeling and consciousness too early and too intensely.

These arguments, however, are offset in the minds of those in favor of continuing the present plan by the following:

(1) In nearly all cases it is more economical to maintain one school than two.

(2) Coeducation makes for equality between the sexes and fits boys and girls to coöperate in business and in life on a basis of equality. This appears to be very important, when we consider the large number of women entering business vocations each year.

(3) Coeducation during the adolescent period is more beneficial than harmful, since it makes informal intercourse in society and business a matter of fact, and corrects many wrong ideas about the relations of the sexes.

In Colleges. Arguments similar to those advanced above were formerly employed against coeducation in the colleges. But the results following the opening of men's colleges to women have apparently been distinctly in favor of coeducation, though in all coeducational colleges and universities the sexes do not of necessity pursue the same courses. Now nearly all the colleges and universities in the United States are coeducational. Yale, Harvard, Princeton and Johns Hopkins are conspicuous exceptions, but Harvard maintains Radcliffe College for Women. All the universities of Canada are open to women, as are those of England, France and Germany; in England, however, the universities do not grant degrees to women, but award them certificates. Either without restriction, or with the exception of a few courses, the University of Vienna admits women to the college of medicine. See COLLEGE, subhead *Colleges for Women.*

COELENTERATA, *se len ter a'ta,* a division of the animal kingdom which includes the coral, the jelly-fishes and the sea anemone, each of

which is described under its title. The name means *hollow intestine.* The animals belonging to this division are next to the lowest in the scale of animal creation. Their structure consists chiefly of a hollow sac whose opening, or mouth, is surrounded with a large number of hairlike organs called *tentacles.* These tentacles are always in motion and they have the power to cling to whatever they touch. By their motion they create currents in the water which bring food to the stomach. These little animals are of various colors, and they form pretty pictures when seen clinging to the rocks at low tide. For this reason they are sometimes called *sea flowers.*

COEUR D'ALENE, *kur da lane',* IDAHO, county seat of Kootenai County, in the northern part of the state, not far from the Canadian boundary. Spokane is thirty-three miles west, Helena, Mont., 357 miles southeast, and Portland, Ore., 399 miles southwest. The Northern Pacific, built to the city in 1887, the Chicago, Milwaukee & Saint Paul, built in 1910, the Coeur d'Alene & Pend d'Oreille, built in 1910, and the Coeur d'Alene & Spokane Electric, built in 1903, serve the city. In 1900 the population was 508; in 1910 it was 7,291. Americans predominate, but there are also many Scandinavians, Germans, English and French.

The city is situated at the north end of Lake Coeur d'Alene, thirty miles in length, and on the Spokane River, the outlet of the lake. The largest fleet of steamboats on any lake west of the Great Lakes navigates the waters of Lake Coeur d'Alene and the two tributary rivers, Saint Joe and Coeur d'Alene. Boats ascend these rivers thirty miles from their mouths. Along the shores of the lake and rivers are numerous popular fishing camps. One of the state fish hatcheries is located at Coeur d'Alene, and the streams and lakes of the entire county are amply stocked with trout, grayling and white fish.

Large lumber-manufacturing plants, woodworking plants, steamboat works and creameries are the important industrial establishments of the city. Coeur d'Alene is also a market for lumber and mining (silver, lead and zinc) camps, and for the dairy, stock, poultry and fruit produce of a large agricultural community. The prominent buildings are the city hall, banks, churches, a cathedral, two hospitals and a city library. Besides the public schools, the city has a Scandinavian school, Coeur d'Alene College, a Roman Catholic Academy and a business college. City Park and Blackwell Park, each containing twenty acres, are recreation points on the lake.

The city, lake and river and a local range of mountains take their name from the Indians who first inhabited the country. Old Fort Sherman military grounds are near the city. A settlement was made at Coeur d'Alene in 1885; it was incorporated in 1887, but had slight growth until after 1900. C.L.D.

COFFEE, a dark brown, fragrant beverage drunk with or without sugar and cream, and either hot or iced. It is a drink which has a place in the lives of most of the people of the world. Its use is so general that the steaming, bracing cup of coffee at breakfast has become an almost universal habit, especially in cool climates, and many arguments have been presented for and against its use. The bitter principle in coffee is called *caffeine,* which is a drug, and it is the presence of this substance which produces effects both good and bad. Caffeine in small quantities (one to four grains) increases blood pressure and is a stimulant. It stimulates reasoning power temporarily, for it whips up the tired brain or muscles to better work, and there is no depressing after-effect as with the use of other drugs. Therefore a cup or two of good coffee a day containing that amount of caffeine is declared not harmful to the average person. But medical authorities assert that more than that a day will many times cause sleeplessness and shaking hands, and will sometimes lead to

COFFEE TREES.

At left, coffee trees in bloom. They are from three to six times the height of the average person. At right, a branch of a tree, showing how the berries grow.

COFFEE.

Above, general view of typical coffee plantation in Brazil. Below, a field of young trees, not yet bearing.

IN THE COFFEE FIELD.

Above, harvesting coffee. Below, loading in the field, *en route* to the cleaning mill.

GETTING READY FOR MARKET.

Above, Brazilians washing coffee. Below, drying it, preparatory to putting it in bags for export.

more serious results, such as headache, palpitation of the heart and indigestion. So, with coffee drinking, as with everything else, the medical injunction is, "Be moderate."

"He knows to live who keeps the middle state,
And neither leans on this side nor on that."

The Story of Coffee Drinking. There are several legends about the discovery of coffee and its use. Some say that a long, long time ago an Arab chief was taken ill in Persia. A wise Persian cured him with a drink brewed from some berries growing wild in the fields, and the Arab carried home with him some of those wonderful berries and planted them, so introducing coffee into Arabia. Another story is that a flock of sheep in Abyssinia fed one day on coffee berries and were restless at night. The shepherds, noticing this wakefulness, investigated and experimented; they liked the taste of the berry and started to use it themselves.

So down the ages from the long ago the use of coffee spread from country to country around the globe, each people preparing the drink to suit its individual tastes. It was discovered that roasting the seed of the coffee berry to a light-brown color brings out the aroma and other desirable qualities. So the drink is prepared from roasted, ground seeds, usually by infusion, like tea. Boiling water is poured over the ground coffee. Some people then let the mixture come just to the boiling point, then settle or clear it with a little cold water. Some prepare coffee by having boiling water slowly drip over the ground coffee, through strainers, to the bottom of the pot. Others find mixing a raw egg with the ground coffee before infusion produces a better result. However, egg in coffee is quite likely to produce sleeplessness. Special pots were designed for the brewing of this favorite beverage, and the *percolator,* with the clear, brown fluid bubbling in its glass dome, is now a familiar sight in homes. Coffee so prepared is clearer than that prepared in the ordinary way; no "grounds" can enter the drinking cup.

In the seventeenth century the coffee houses of London played a very real part in the life of the day. In them were organized many of the social, political and literary clubs to which most of the illustrious men of the nation belonged; and from them went out judgments from which there was no appeal.

How Coffee Grows. When wild, the coffee tree grows from fifteen to thirty feet high, but under cultivation it is seldom allowed to grow higher than six feet. The tree is an evergreen, with dark-green leaves having a waxy upper surface, and both stamens and pistils are borne on the same tree. The flowers are white and fragrant, but rarely last more than a day. The fruit is cherrylike, dark red when ripe. Each berry has two cells, each cell a single seed, which is the coffee nib or bean. The name "bean" comes from the Arabic *bunn,* meaning *coffee.* These beans are light green before roasting.

BRANCH OF COFFEE TREE
Showing coffee berries as they grow.

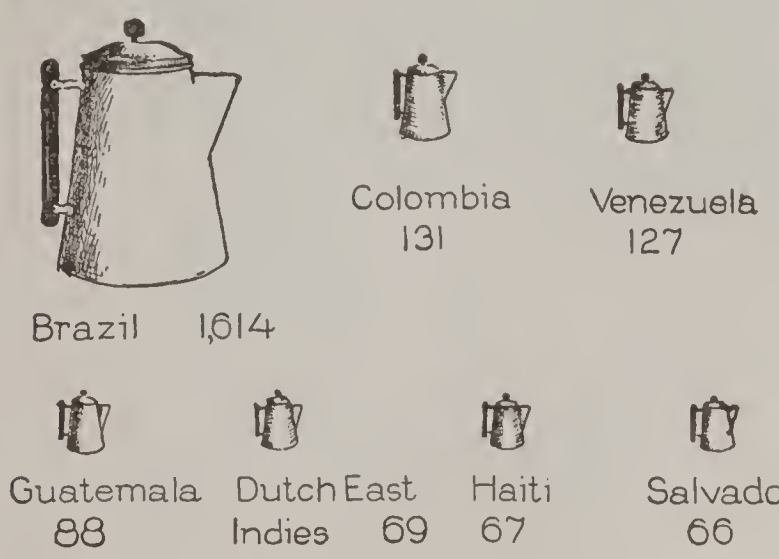
The coffee plant thrives in sandy or gravelly soil on high lands where the temperature throughout the year ranges from 60° to 90° F. The plants are cultivated both from seeds and from shoots. The trees need shade at first and plenty of water, but less and less water as the fruit begins to ripen. The average yearly yield of a tree is one and one-half to two pounds of seeds, but there are usually two or three crops, and some trees produce two to five pounds. Fruit is borne from the third year; and a tree usually produces for about twenty to fifty years, but in some cases the fruit-bearing period lasts 100 years.

Preparation for the Market. When ripe, the fruit is shaken from the trees upon canvas placed below, or sometimes is picked by hand. The berries are dried in the sun, then passed between rollers which crush the dried pulp but do not crush the seeds. The pulp is then blown away from the seed by a current of wind passed over them. When thoroughly dried the seeds are packed in large burlap sacks and shipped to market. Roasting is done when desired for use. In Brazil the pick-

ing season lasts from April to November, and both ripe and unripe berries are shipped. Colombia exports only the ripe berries.

The Coffee Industry. The principal coffee plantations are in South America, Brazil raising about two-thirds of the world's supply. The great demand for coffee for a long time led to the use of substitutes such as chicory, but pure food laws now generally require a mention on the label of the presence of chicory or foreign substances. In parts of Sumatra the leaves of the coffee tree are also used to make the beverage.

Where Coffee Comes From. The countries whose production is shown graphically in the chart are the source of about nine-tenths of the world's supply. Several other lands raise coffee on a smaller scale, among them the following, the figures representing pounds per year:



THE COFFEE SUPPLY

The principal coffee-growing countries shown by graphic illustrations, drawn to scale. The figures represent millions of pounds produced.

Mexico	54,000,000
Porto Rico	50,000,000
British India	37,000,000
Costa Rica	32,000,000
Nicaragua	24,000,000
Jamaica	10,000,000

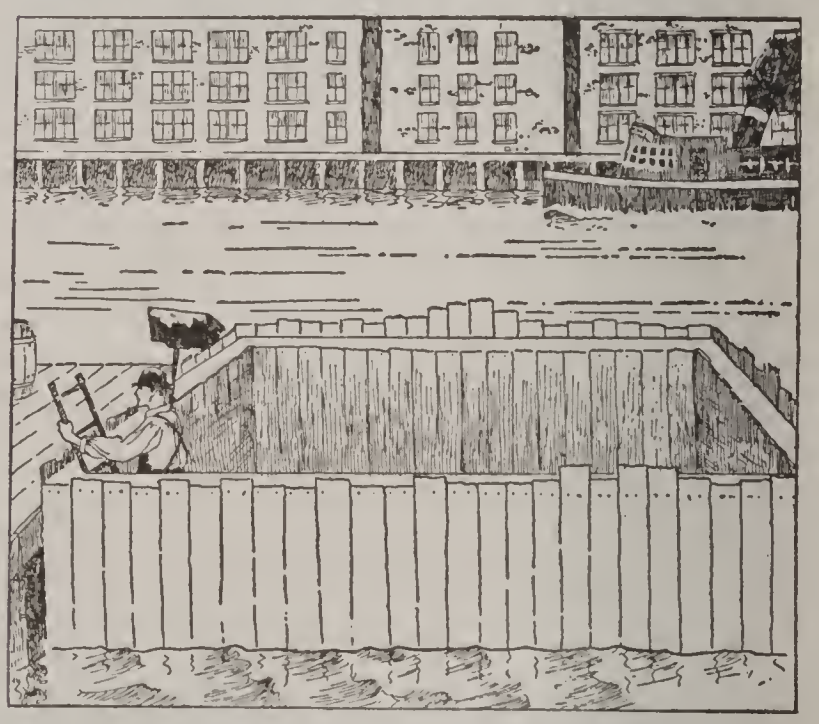
Where the Coffee Drinkers Live. The United States is not only the world's greatest consumer of coffee, but actually imports more than a third of all that is raised. The government estimates that the average American drinks ten and one-half pounds, or perhaps 365 cups, each year. In Canada, where tea is the favorite breakfast beverage, the individual allowance is only two pounds. Here are the figures for the number of pounds consumed by each coffee drinker in some of the other nations:

Netherlands	15	Belgium	10
Sweden	12½	Finland	9½
Denmark	12	Cuba	9
Norway	11		

Description of Varieties. *Mocha* coffee is a small, grayish-green bean. The name was taken from an Arabian port of that name, which exported at one time the finest coffee in the world; but names no longer signify the places from which the coffees come. *Java,* or *East Indian,* coffee is a large, yellow bean. *Jamaica* is a smaller greenish bean; *Bourbon,* yellow, almost whitish. *Surinam* coffee has the largest beans, and another large variety, called *Liberian,* is grown in West Africa. Mixtures of these produce other varieties. J.R.F.

Consult Keable's *Coffee, from Grower to Consumer;* Walsh's *Coffee: Its History.*

COF'FERDAM, a temporary enclosure erected in water, usually formed of two or more rows of piles driven close together with the spaces between packed with clay. When the enclosure is complete the water is pumped out for the purpose of forming dry foundations for piers and bridges or other underwater work. The most remarkable use of cofferdams in recent times occurred when the sunken battleship *Maine,* in Havana harbor, was raised in 1912 for examination. The vessel was surrounded



AN ORDINARY COFFERDAM

by a huge cofferdam, the water was pumped out and when the leakage in the vessel had been remedied the water was allowed to flow into the cofferdam, thus raising the vessel.

COFFEYVILLE, Kan., a manufacturing city of Montgomery County, in the southeastern part of the state. The Oklahoma state line is about a mile and a half south, and the Missouri state line is seventy-five miles east. Independence, the county seat, is fifteen miles north and west. Coffeyville is on the Verdigris River, and on the Atchison, Topeka & Santa Fe; the Missouri, Kansas & Texas; the Mis-

souri Pacific, and the Saint Louis, Iron Mountain & Southern railroads. It is the terminus of two interurban lines. In 1910 the population was 12,687; in 1920 it was 13,452. The area of the city is nearly three square miles.

About Coffeyville is a rich agricultural country. Extensive oil and gas wells, zinc and lead mines, cement rock and shale beds furnish abundant raw materials for a great number of manufactories. The most important of these are a large zinc oxide smelter, the product of which is the base of paint, three oil refineries and an oil tank car factory.

The city has a Federal building costing about $75,000, a $50,000 city hall, a Carnegie Library, four banks, two hospitals, an opera house and Y. M. C. A. and Y. W. C. A. organizations. There are two small parks, Brown's and Forest Park.

Coffeyville was settled in 1869 and named in honor of A. M. Coffey, a member of the state legislature. In 1871 the town was removed about a mile from the original site and was then incorporated. The commission form of government was adopted in 1912. D.D.B.

COFFIN, the burial case, usually a box or chest, in which the dead are placed. Coffins at the present time are most generally made of wood, though metal, stone, glass and terra cotta are sometimes employed. The outside is ordinarily covered with cloth or velvet, white being used for young persons, and black and various shades of gray for the more aged.

The Greeks made their coffins of burnt clay; sometimes this was first molded around the body and then baked. Urn-shaped and triangular coffins, the body being placed in the latter in a sitting position, were also common. The Romans at first burned the bodies of their dead (see CREMATION), but at the beginning of the Christian Era stone coffins were introduced. Many examples of these, dating from the Roman period, have been excavated in England. Among the wealthy Romans limestone coffins were in favor. As this stone was supposed to consume the body, the name sarcophagus (which see) was applied to limestone coffins, for the word *sarcophagus* means in Greek, *flesh-eating.*

A wooden coffin made of a tree trunk, cut through the center and hollowed out, formed the burial case of primitive man. This variety was used in England in the Middle Ages by those who could not afford stone coffins, while the poorest people were buried with only a cloth for a covering. References in English fiction show that in later times wooden coffins were in common use. George Eliot's carpenter-hero of her novel *Adam Bede* made his own father's coffin, and in the masterpiece of Dickens, when little David Copperfield was on his way from school to attend his mother's funeral and stopped at a shop in Yarmouth to be measured for his mourning, he heard in an adjoining room the *tap, tap* of the workman who was making the coffin for his mother.

Coffins are also used at the present time to enclose bodies which are cremated, in which case they are made of light, easily-consumed material, such as papier mâché. See BURIAL.

COF'FIN, CHARLES CARLETON (1823-1896), an American historian and war correspondent, remembered chiefly as the author of a group of vivid and spirited historical tales for boys, among which are *Following the Flag, Winning His Way, Boys of '76, Building the Nation* and *Boys of '61.* He was born at Boscawen, N. Y., the son of a farmer who was able to give him but little schooling. From civil engineering and telegraphy he worked his way into journalism. At the outbreak of the War of Secession he became field correspondent for the Boston *Journal,* and his graphic descriptions of Bull Run, Antietam, Gettysburg and other battles, of which he was an eye-witness, gave his paper a unique reputation. Later he made a tour of the world.

COHESION, *ko he'zhun,* in physics, is one of the properties of matter, the power which makes particles of the same substance stick together. Solids have the greatest amount of cohesion, liquids have much less, and gaseous substances none at all. If it were not for the force of cohesion the particles comprising brick, stone, iron or any other substance would not hold together, and all the buildings of a city would crumble to ruin if its power should suddenly become ineffective. For example, the different parts of a solid iron wheel are held together by this force, and they therefore cohere when the wheel is in motion. If the strain becomes too great, however, and the limit of their power to hold together is exceeded, each part moves off in a straight line instead of in a curved path, and the wheel flies to pieces. Proof that liquids have this property to but slight degree is seen in the case of water, which changes its shape with every change of pressure. Gases, if relieved of pressure, tend to scatter; the particles become divided and are dissipated into the air. Cohesion differs from adhesion (which see) in

that it applies to particles of the same kind, while adhesion is the force that holds together unlike particles.

COHOES, *ko hoze'*, N. Y., an industrial city with a population which increased from 24,709 in 1910 to 25,049 in 1914. Three mills were destroyed by fire in December, 1913, which probably accounts for the decrease to 22,987, reported by the Federal census of 1920. Cohoes was first settled by the Dutch, as early as 1630; it was incorporated as a village in 1848 and chartered as a city in 1870. The falls of the Mohawk River suggested the name, which is the Indian word for *falls*. The area is more than three square miles.

Cohoes is situated in Albany County, on the Erie Canal and at the confluence of the Hudson and Mohawk rivers. Troy is three miles east, Albany, the state capital, is nine miles north, and Schenectady is eighteen miles northwest. The city is served by the Delaware & Hudson Railroad, constructed to the city in 1853, and by the Troy-Schenectady branch of the New York Central, built in 1842. Electric railways connect with Troy, Albany and adjacent towns.

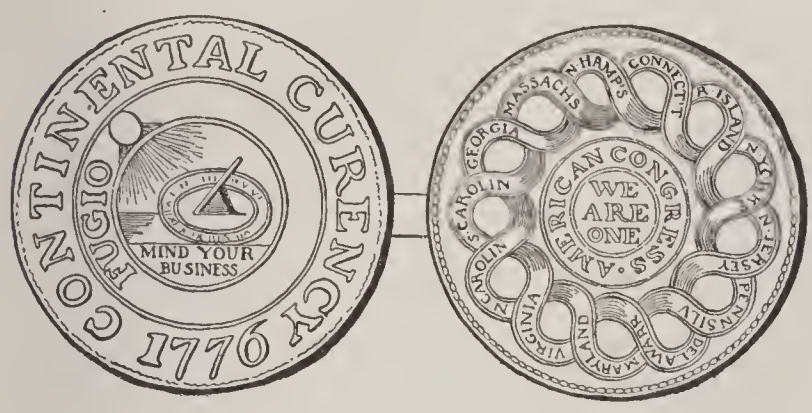
The Mohawk Valley, in which Cohoes is located, is famous for its beautiful scenery. At this point the river is spanned by a bridge which affords an excellent view of the falls, which are about seventy feet high. Abundant water power is furnished for the operation of over 300 manufacturing plants. The cotton-goods industry is the most important, and owing to its extent Cohoes is popularly called the *Spindle City*. There are five large cotton mills, including one of the well-known Harmony Mills. These mills employ 3,250 people. The Harmony Mills alone have 275,000 spindles and use 300,000 pounds of cotton per week. The city is also noted for its knit-goods trade, and is actively engaged in the manufacture of boxes, iron-pipe, machinery, wood pulp, and collars and cuffs. The Cohoes Company has constructed a power plant at a cost of $1,500,000, which generates from 30,000 to 50,000 horse power. The mills of Cohoes will be operated by this plant. J.E.C.

COINAGE, *koyn'aj*. As far back as we can trace real money we find it to consist of some metal—gold, silver and bronze being the ones most generally used. The value was regulated by weight, and the names of coins used by different nations were derived from the names of these weights, as the Hebrew *shekel* and the English *pound*, the latter being formerly a pound of silver. This method of exchange was very inconvenient, and governments at an early day, centuries before the Christian Era, issued pieces of metal stamped with their value, and bearing some symbol of authority to denote that they were issued by the government. These pieces of metal were named *coins*. The word means *wedge*. A wedge-shaped die was used in stamping the metal, and in time the name of the die was given to the metal stamped by it. The manufacture and regulation of coins is called *coinage*, and is a function of national governments.

Qualities of Coin. The value of coins depends upon the uniformity of weight and *fineness*, that is, upon the degree of purity of the metal of which they are made. In order that coins may be acceptable to the people and therefore circulate freely, they must bear some mark indicating that the qualities of weight and fineness, which determine value, are guaranteed. The Roman penny bore a raised portrait of the emperor. The English sovereign has the head of the ruling sovereign on one side and Saint George and the dragon on the other. The dollar of the United States has the American eagle with the legend "United States of America" on one side and the head of the Goddess of Liberty with the legend *E pluribus unum* and the date of coinage on the other. Every coin has its value stamped on one side. Canadian coins have the bust of the English sovereign on the face, and the value stamped on the reverse side.

Coins must also be of such shape as will make them convenient for handling and at the same time enable one to detect at sight any clipping or other defacement. Rounded forms have been found most desirable; therefore the coins of nearly all countries are circular. In Japan and China oval coins are still used, and some of the small coins of these nations have square holes in the center.

United States. The Constitution conferred upon Congress the power to coin money and regulate its value. A mint (see MINT) was established in Philadelphia in 1792, and the first coins were struck the following year. The



FIRST AMERICAN COIN
Coined in Massachusetts in 1776.

first machinery employed, compared with that now in use, was very crude, and some of the operations of manufacture were by hand. Now all work is done by machinery and such a degree of precision has been reached that seldom one coin in a million varies from the precise limit in size and weight allowed by law.

Gold and silver come to the mint in bars, and are known as *bullion*. The metal is purified, then the necessary proportion of copper to make it nine-tenths fine is added (see ALLOY). It is then cast into bars, which are rolled into ribbons the width and thickness of the coin. From these ribbons the coins are cut by punches, the "blanks" so formed being known as *planchets*. These "blanks" are cleaned and weighed, then placed in tubes on the stamping machines, from which they are automatically fed to the stamps. These machines will stamp ninety large coins and 120 small ones in a minute.

Classes. Every system of coinage has two classes of coin—*standard coins* and *token coins*. Standard coins are those whose actual value in metal is the same as that stamped upon them; that is, the gold in the gold coins is worth as much as the coin. If your house burns down and melts ten $10 gold pieces and you can find the entire melted mass no financial loss has resulted. Gold and silver are the only metals from which standard coins are made, and in most countries the standard has been restricted to gold..

Token coins are those whose actual value is less than that stamped upon them, such as those of the denominations twenty-five cents, ten cents, five cents and one cent. They pass for the value given them, because they are guaranteed by the government; that is, they can be exchanged for gold coin of the same value. One having fifty dimes could exchange them for a five-dollar gold piece.

Free Coinage. England and the United States have always coined standard coins free of charge. One can take his gold to the mint and receive its full value in coin, no charge usually being made for coinage; when such a charge is made it is called *seigniorage*. No person can exchange his bullion for "small change," for all governments reserve to themselves the right to make token coins, since a large revenue is derived from this coinage. For instance, if the United States makes from a bar of nickel costing ten dollars twenty dollars' worth of five-cent pieces, the government gains ten dollars less the cost of coinage.

Other Nations. All large nations coin their own money, but government control of coinage does not mean that a nation must make its own coin. The smaller nations of Europe and the nations of South and Central American countries have their coins made in Europe and the United States. Canada maintains a branch of the Royal Mint at Ottawa, which makes the coin for the Dominion. See MONEY. E.D.F.

Consult Hepburn's *History of Coinage and Currency in the United States.*

COINS, FOREIGN. All civilized countries have some form of money, for whenever men trade or a change of commodity is made a medium of exchange is necessary. The monetary value of coins of various nations, however, is subject to frequent change, though in the relative value there is but little variation. Names are given to the various coins from their value or from the device or effigy stamped thereon. In the series of earliest coins we find records of tradition and historical events. The monetary pound was once a pound weight of silver and was derived from the money of Charles the Great. The money systems in Europe all trace back to this system, but with the adoption of flat, circular coins the cumbersome method of weighing was abandoned. A distinct advance was made when each nation began to make its own coins, each piece being

Value of Foreign Coins in Normal Times

(*c*) copper; (*g*) gold; (*s*) silver

Coin	Country	United States Equivalent	Coin	Country	United States Equivalent
Argentina, *g*	Argentine Republic	$4.82	Leu, *s*	Rumania	$0.193
Balboa, *g*	Panama	1.00	Libra, *g*	Peru	4.866
Bolivar, *s*	Venezuela	.193	Lira, *s*	Italy	.193
Boliviano, *s*	Bolivia	.389	Lira, *g*	Turkey	4.40
Cash, *c*	China	.006	Mark, *s*	Germany	.238
Cent, *c*	China	.005	Mark, *g*	Finland	.193
Centavo, *c*	Mexico	.005	Medjidie, *g*	Turkey	.88
Centime, *c*	France	.002	Milreis, *s*	Brazil	.546
Colon, *g*	Costa Rica	.465	Milreis, *g*	Portugal	1.08
Condor, *g*	Colombia	10.00	Napoleon, *g*	France	3.86
Condor, *g*	Chile	7.30	Onlik, *s*	Turkey	.40
Condor, *g*	Ecuador	4.866	Ore, *c*	Scandinavia	.0025
Crown, *s*	Austria	.203	Para, *s*	Turkey	.001
Crown, *s*	Denmark	.268	Penny, *c*	Great Britain	.02
Crown, *s*	Great Britain	1.22	Perper, *g*	Montenegro	.203
Crown, *s*	Norway	.268	Peseta, *s*	Spain	.193
Crown, *s*	Sweden	.268	Peso, *g*	Argentine Republic	.96
Dinar, *g*	Serbia	.193	Peso, *s*	Central America	.436
Dinero, *s*	Peru	.05	Peso, *g*	Chile	.365
Dollar, *g*	British Honduras	1.00	Peso, *g*	Colombia	1.00
Dollar, *g*	Newfoundland	1.014	Peso, *g*	Cuba	1.00
Dollar, *g*	British Possessions	1.00	Peso, *s*	Mexico	.498
Dollar, *g*	Colombia	.973	Peso, *s*	Paraguay	.436
Dollar, *g*	Liberia	1.00	Peso, *g*	Philippines	50
Dollar, *g*	Straits Settlements	.57	Peso, *g*	Uruguay	1.034
Dollar, *s*	China	.48	Pfennig, *c*	Germany	.0025
Dollar, *g*	Santo Domingo	1.00	Piaster, *s*	Cochin-China	.55
Doubloon, *g*	Chile	3.65	Piaster, *s*	Turkey	.044
Drachma, *s*	Greece	.193	Pound, *g*	Egypt	4.94
Escudo, *g*	Chile	1.82	Pound, *g*	Great Britain	4.866
Farthing, *c*	Great Britain	.005	Ruble, *g*	Russia	.515
Florin, *s*	Austria	.40	Rupee, *s*	India	.324
Florin, *s*	Great Britain	.49	Scudo, *g*, *s*	Italy	.95
Florin, *g*	Netherlands	.402	Sen, *c*	Japan	.005
Franc, *s*	France	.193	Shilling, *s*	Great Britain	.24
Franc, *g*	Belgium	.193	Sixpence, *s*	Great Britain	.12
Franc, *g*	Switzerland	.193	Sol, *s*	Peru	.49
Gourde, *s*	Haiti	.965	Soldo, *c*	Italy	.01
Guilder, *s*	Netherlands	.40	Sovereign, *g*	Great Britain	4.866
Guinea, *g*	Great Britain	5.04	Sucre, *g*	Ecuador	.487
Gulden, *s*	Austria	.48	Tael (customs), *s*	China	.727
Heller, *s*	Austria	.004	Tical, *s*	Siam	.378
Kopeck, *c*	Russia	.005	Yen, *s*	Japan	.498

stamped to indicate its weight, purity and value.

Comparative Values. Monetary units of foreign countries with their values in dollars are given above, as they were before the War of the Nations.

COKE, *kohk.* Bituminous, or soft, coal, when burned with a limited supply of air in kilns, called ovens, produces a variety of charcoal called *coke.* The best ovens are long and narrow and are heated by gas. As fast as the charge is coked it is pushed out through doors at the bottom and a new charge is put in at the top. Coal tar, ammonia and gas are obtained as by-products in the manufacture of coke. Some of this gas is used in heating the coke ovens, and the remainder is sold for heating and lighting purposes.

Good coke has a blackish-gray color, is hard, brittle and porous. It burns without flame or smoke and produces intense heat. It is used in smelting iron ore, because it is free from sulphur and other substances that injure the iron. It is also used in melting metals for casting and to an increasing extent in furnaces for warming houses. Coke is manufactured extensively in England, and in Western Pennsylvania, West Virginia and Tennessee in the United States, and to a limited extent in British Columbia. Not all bituminous coal makes good coke, and coke ovens are located only in those regions that have good coking

coal. See Coal, subhead *Bituminous Coal;* Charcoal.

COLBORNE, *kol'bohrn,* John, first Baron Seaton (1778-1863), English general and colonial administrator; lieutenant-governor of Upper Canada from 1830 to 1837. He served with great distinction in Egypt, Spain and Belgium under Sir John Moore and the Duke of Wellington, and was especially conspicuous at the Battle of Waterloo. In 1830 Sir John became lieutenant-governor of Upper Canada. Having resigned his position, he was about to depart for England when the Upper Canada rebellion broke out (see Canada, subtitle *History*). By special order of the home government he took command of the British forces and quickly crushed the outbreak. Later he held several other high offices in the service of his country and in 1860, on his retirement from the army, was created field marshal.

He was raised to the peerage as Baron Seaton, in 1839.

COLCHICUM, *kol'kik kum,* the poisonous meadow saffron, a plant of the lily family, valued because of the medicinal properties of its seeds and root, or corm. From these is obtained a poisonous, bitter alkaloid, called *colchicine,* used in preparations for the relief of gout. The meadow saffron grows wild in the moist meadow-lands of England and Ireland, Middle and Southern Europe, and in the Swiss Alps. Its pale purple flowers, which bloom in the autumn, are much like those of the crocus. As it is one of the most beautiful of the autumn-flowering plants, colchicum is often found in gardens. It is easily cultivated if planted in a light, sandy loam where there is plenty of moisture.

COLD, an infection of the mucous membrane of the nose and throat and of other organs to which it may spread. It is accompanied in severe cases by fever (in the early stages), running of the eyes and nose, cough, lassitude and headache. If neglected, a cold may cause serious inflammation of the lungs, kidneys, heart or other organs; tuberculosis, pneumonia and bronchitis are some of the diseases that may result from taking cold. As infections are due to germs, one may take cold by breathing foul, stuffy air or by being in the same room with someone who is suffering from the malady. Sneezing and coughing are often responsible for the spread of colds through a household. Intemperance, constipation and other unhygienic habits of living predispose one to colds, for when the body resistance is weakened disease germs more easily affect the mucous membranes.

When the first symptoms of a cold appear, vigorous measures should be taken to arrest the infection. Rest in bed with little food, hot foot-baths and hot drinks and the use of a purgative will be found helpful. It is well to consult a physician if a cold persists and does not yield to home remedies. Colds that "get well of their own accord" are aided by the antitoxins which the body manufactures (see Medicines and Drugs). It is well to have in the home a mild, antiseptic nose and throat spray, as a guard against attacks. A prescription may be obtained from any reliable nose and throat specialist. The practice of taking cold baths, sleeping with the windows wide open and taking plenty of exercise tend to keep the body in a resistant condition. W.A.E.

COLD STORAGE. We are all familiar with the refrigerator or ice chest used in the home to preserve articles of food in hot weather. The chamber in which these articles are stored is kept cool by ice, placed in another chamber. The heat which melts the ice is drawn from the air in the refrigerator and in this way the ice reduces the temperature.

In Turkey and other Eastern countries earthen jars and bottles with thin, porous walls are used for cooling drinking water. Some of the water oozes out through the pores of the vessel and evaporates. The heat required for this evaporation is drawn from the water, which is thus kept at a pleasing temperature for drinking purposes.

These two simple devices illustrate the principle upon which all plants for reducing temperature are constructed. The principle is as follows:

A solid changing to a liquid or a liquid changing to a vapor or gas absorbs heat which it draws from surrounding objects, thus reducing their temperature.

A Cold Storage Plant. The necessary parts of a cold storage plant are the machinery for cooling the air and storage rooms for the articles to be preserved. Practically all large plants use the method of evaporating a volatile liquid (one that evaporates readily) for reducing the temperature. Ammonia, sulphuric ether, sulphurous acid and carbonic acid are all suitable for the purpose, but ammonia (which see) because of its cheapness and the low temperature at which it changes to a gas is used much more extensively than all the others. The ammonia used is a liquid, formed by con-

densing ammonia gas, which is easily converted into a liquid at 32° above zero F. or 0° Centigrade (the freezing point), under a pressure of about sixty-one pounds to the square inch. This liquid contains no water and is generally known as *anhydrous ammonia.*

The refrigerating apparatus consists of a force pump for condensing the ammonia gas to a liquid; a tank for holding the liquid ammonia; coils of pipe or an expansion chamber in which the ammonia changes to a gas; and pipes for returning this gas to the pump to be again condensed to a liquid. In its change to gas the ammonia rapidly reduces the temperature of surrounding objects.

The plants are in charge of workmen who thoroughly understand the system, and they maintain any temperature desired. Rooms for preserving beef, mutton and pork for a short time are kept at just below the freezing point; for long storage, 20° colder. Those for the preservation of poultry and fish must be several degrees below freezing, because these articles must be kept frozen. Eggs and fruits require a temperature of about 36° F., but it is claimed that butter retains its flavor better if kept at a temperature below the freezing point. Milk, however, should not be frozen. The rooms in which butter, eggs and milk are stored must be scrupulously clean, and the air free from

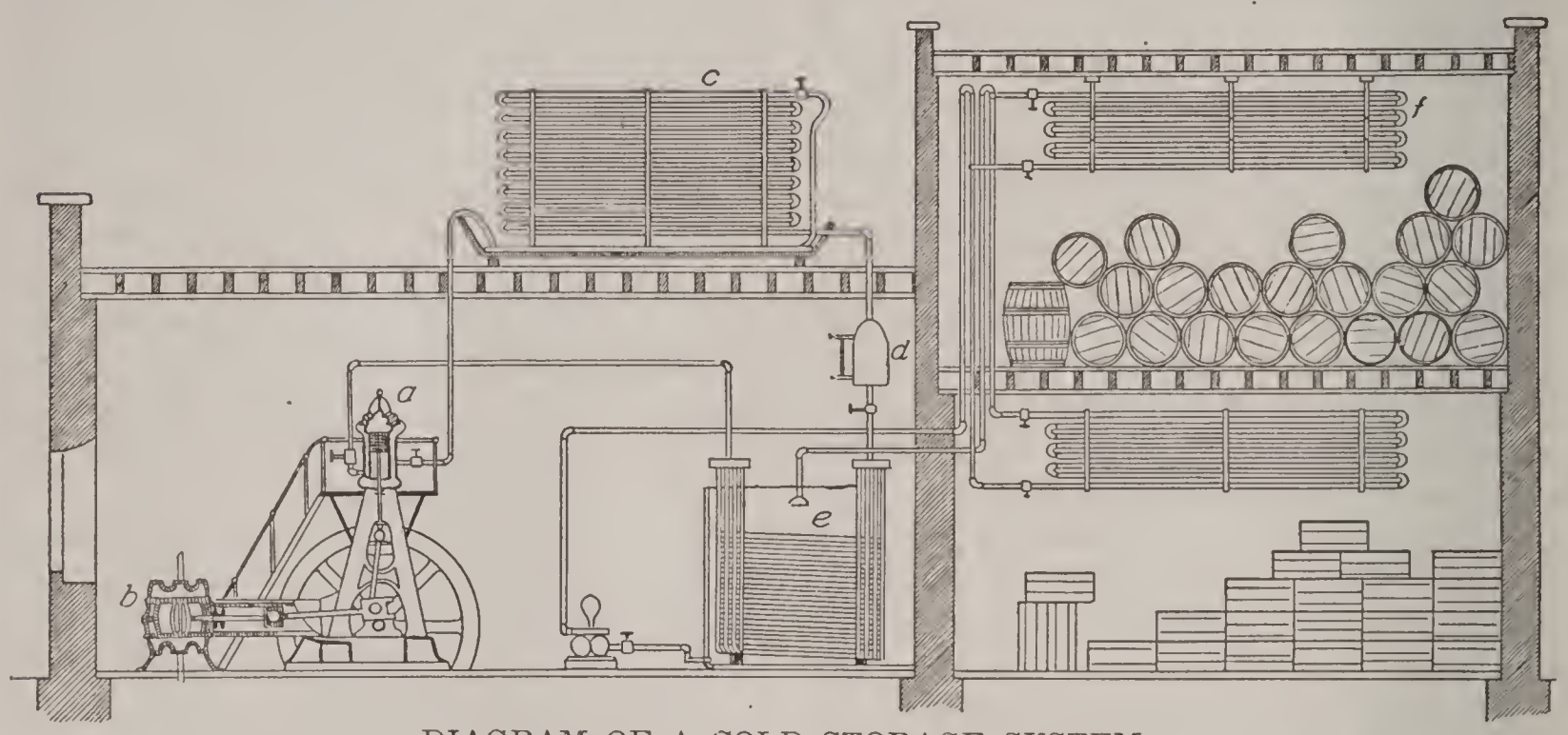


DIAGRAM OF A COLD STORAGE SYSTEM

The illustration shows a compression system for a cold storage machine. *a* is the compressing cylinder, which is driven by the engine *b*. The gas on being compressed in *a* passes up through the pipe to the condenser *c*, and then to the liquid ammonia reservoir *d*. Thence the liquid ammonia at a temperature of about 0° F. flows in coils of pipe in the brine cooling tank *e*, and abstracts heat from the brine by being evaporated. The brine cooled by the evaporation of the ammonia passes into the coils *f*.

In large plants the evaporation takes place in a closed chamber containing coils of pipe filled with strong brine, which freezes at a much lower temperature than water. The cold brine is conducted through pipes to all parts of the storage room, and in this way an even temperature is maintained. After completing the circuit of the pipes the brine returns to the refrigerating coils and is used over and over again.

The storage rooms usually have double walls, with an air space between to protect them from the temperature of the outside air. The ceiling is low, seldom exceeding eight or nine feet, and the pipes are so distributed as to maintain a uniform temperature in all parts of the room. There must be enough ventilation to keep the air pure, but too much interferes with the temperature.

odors, or these articles may become tainted and unfit for use. See *Cold Storage Temperatures,* below.

Uses of Cold Storage. What the housewife does on a small scale with her refrigerator, the operators of cold storage plants do on a large scale. Sometimes as many as a hundred million cases of eggs (3,600 million dozen eggs) are in storage at one time. Nearly all fruits, vegetables, meats, milk, butter and eggs placed on the market in large cities come from cold storage warehouses. Every local meat market, hotel, grocery and modern apartment house has its cold storage room, in which are kept all articles of food that would perish at ordinary temperatures.

Refrigerator cars transport fruit, milk, butter and meat long distances and deliver them in a condition of perfect preservation. The

cars are cooled by ice placed in a chamber in the top. Refrigerator ships, however, have regular cooling plants, and they are employed in carrying fresh meat across oceans from one country to another.

Cold Storage Temperatures. Many people do not know at what temperatures different articles should be kept to preserve them in best condition. The following table is approved by authorities, the figures being degrees of temperature, Fahrenheit:

Apples (long storage)	31-34
Apples (short storage)	40-45
Bacon and hams	40-45
Butter (long storage)	10
Butter (short storage)	20-25
Cheese (strictly cool cured)	60
Cheese (ordinary cured)	35-40
Eggs	29
Fish (frozen)	15-18
Fruit	36
Furs and woolens	30-40
Grapes	35-38
Meats and dressed poultry (10 to 20 days)	30
Meats and dressed poultry (long storage)	10-15
Pears	33-36
Peaches	32-40
Potatoes	36

Advantages. Cold storage has many advantages. By this means fresh meat can be preserved until it becomes tender. Fruits, eggs and other perishable articles of food can be purchased in large quantities and preserved until needed. In this way shiploads of fruit are prevented from decay, because the apple, peach, orange and grape crops cannot be properly cared for as they ripen. Eggs can be purchased during the spring and summer and stored for winter, when the production is small. Without the system of cold storage to supply the population of large cities with these articles, the food question would become a very serious problem.

Disadvantages. While cold storage has become a necessity it is not without its disadvantages. Cold storage plants are expensive, and require large capital for their operation. Under the present system in the United States they have formed a combination which is virtually a trust, having for its purpose the control of all the perishable food products of the country. Farmers are often unable to sell their produce, beef and pork at a fair profit, but the trust sells to the retail grocers and butchers at such prices as compel the latter to sell to the consumer at a much higher price than would otherwise be necessary.

Again, articles, especially eggs, may be held in storage so long that they lose much of their good qualities, and may even become unwholesome. The third disadvantage is that these large combinations drive small dealers out of the market.

Special Uses of Cold Air. Cold air is used for protecting furs from insects during the summer, for cooling hotels, hospitals, theaters and other public buildings, and to harden chocolate candy before it is placed on the market. In cities there are firms which engage to furnish cold air for cooling buildings, running it through pipes, the same as gas, and they find many customers. C.R.M.

COLE'MAN, a coal-mining town at the eastern end of the Crow's Nest Pass coal fields, in the province of Alberta. It is on Old Man River and the Canadian Pacific Railway, six miles east of Crow's Nest Pass and ninety miles west of Lethbridge. More than half of the population works in the coal mines. There is some lumbering and ranching in the vicinity, and for sportsmen there is good fishing and shooting. Population in 1911, 1,557; in 1916, about 2,000. A.M.M.

COLE'MAN, ARTHUR PHILEMON (1852-), a Canadian geologist, equally distinguished as an investigator and as a teacher. He was born at Lachute, Que., but in boyhood removed to Ontario, where he attended the Cobourg Collegiate Institute and Victoria University. After graduation from the latter in 1886, he pursued his study of the natural sciences at the University of Breslau, Germany, and after his return to Canada was professor of geology at Victoria University until 1890. For several years he taught metallurgy and assaying at the School of Practical Science, Toronto, and was also geologist to the Ontario Bureau of Mines. Since 1895 he has been professor of geology at the University of Toronto. Professor Coleman explored and mapped several sections of the Rocky Mountains and also made a geological survey of the Sudbury district in Ontario. His reports on the geology and mineral resources of Ontario are authoritative.

COLEOPTERA, *kohl e op' ter a.* See BEETLE.

COLERIDGE, *kohl' rij,* SAMUEL TAYLOR (1772-1834), an English poet whose verse represents the best elements of the Romantic movement (see ROMANTICISM), and who was the associate of Southey and Wordsworth in the "Lake School" of poetry. He was the tenth child of a poor clergyman of Ottery Saint Mary, and at the age of ten was placed as a charity pupil in the famous Christ's Hospital, London, where he had Charles Lamb for a

schoolmate. Coleridge remained at this school for eight years, and in 1791 entered Cambridge University, but was unable to finish his course. A visit to Southey in 1794 was notable from the fact that the two young men, enthusiastic believers in the principles of the French Revolution, planned to found, on the banks of the Susquehanna River in America, an ideal brotherly community. Lack of capital put an end to this dream.

In 1795 Coleridge married the sister of Southey's wife, and was soon settled near Wordsworth's home, at Nether Stowey. The result of their companionship was the publication, in 1798, of *The Lyrical Ballads,* the remarkable volume of poems that marks the beginning of the Romantic Period of English literature. To this Coleridge contributed that masterpiece of modern ballad writing, *The Rime of the Ancient Mariner.* During the same year he traveled in Germany with Wordsworth, where he became an eager student of the philosophy of Immanuel Kant.

On his return to England he settled in Keswick, in the beautiful Lake country, to be near Wordsworth and Southey, and at this time did some of his best writing. It was during this period also, that he began to suffer from rheumatic pains that brought him into the grip of the terrible opium habit. Unable to fight the battle alone, he lived from 1816 until his death in the home of a London friend, leaving his family to the care of Southey. His great book of literary criticism, *Biographia Literaria,* appeared in 1817, but his creative powers were so weakened that in his later years he produced little that was noteworthy. His personal charm and extraordinary gifts in conversation, however, made him to the end a notable figure in his own circle.

Coleridge's fame as a poet rests chiefly on *The Ancient Mariner, Christabel* and *Kubla Khan,* three poems that express in the highest degree the splendor of his imagination and his sense of melody. His gifts as a literary critic were hardly less remarkable, and he is honored as the father of modern Shakespearean study. Furthermore, he exerted a tremendous influence on nineteenth-century thought by his introduction into England of German literature and philosophy. B.M.W.

COLERIDGE-TAYLOR, *kohl'rij ta'ler,* SAMUEL (1875-1912), an English musical composer whose best-known work is a composition for orchestra and chorus entitled *Hiawatha's Wedding.* He was born in London, and on his father's side was of African descent. At the age of fifteen he entered the Royal Academy, continuing his studies until 1896, when he began an independent career as a composer. Both in England and America, which he visited in 1904, 1906 and 1910, his work was held in high regard. His chief compositions include a *Symphony* in A minor; *Four Waltzes* for orchestra; a *Concerto,* for violin and orchestra; an operetta, *Dream-Lovers;* an oratorio, *The Atonement;* five choral works, pieces for the piano, and songs.

COLFAX, *kohl'faks,* SCHUYLER (1823-1885), an American statesman, who first achieved fame as the editor of the South Bend *Register,* in his day the most powerful Whig publication in Indiana. He was born in New York City, but moved to Indiana in 1836. Elected to Congress in 1854, he served seven terms, and during this time he was Speaker of the House from December 7, 1863, to March 4, 1869. During Grant's first term as President, Colfax was Vice-President of the United States. While holding that office he was accused of postal frauds and his name was connected with the Credit Mobilier scandal, but nothing was proved against him. His later years were spent delivering lectures, and he was the founder of the Daughters of Rebekah branch of American Odd Fellowship. See CREDIT MOBILIER.

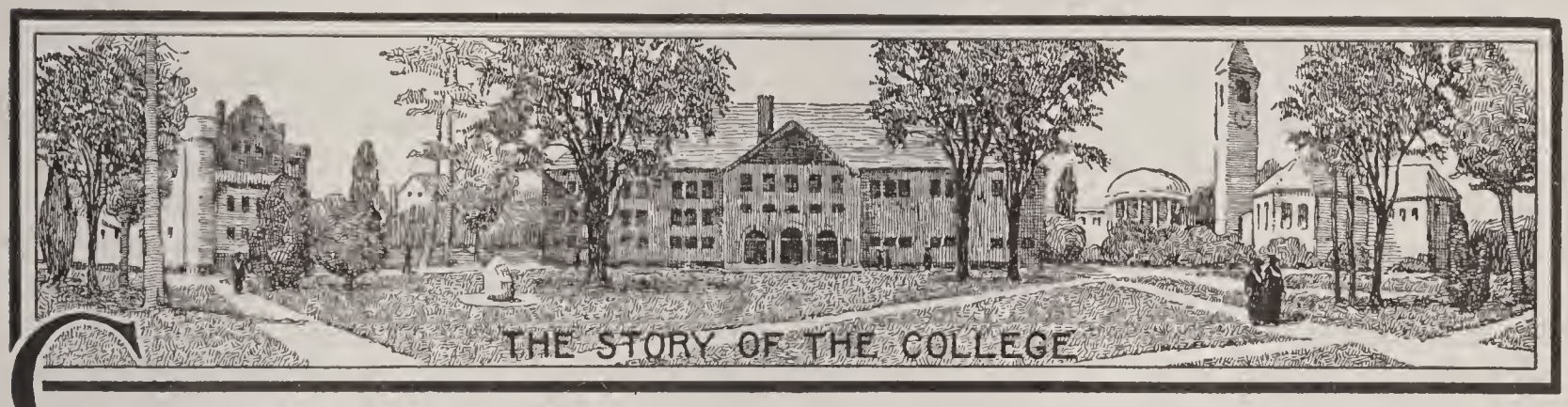
COLIC, *kol'ik,* a severe cramping pain in the bowels or neighboring organs, caused by cold, poisoning or irritating food. Colic is common in babies during their first six months, although if infants are kept clean, warm and properly and regularly fed, it should not appear. Usually the application of a hot water bottle to the abdomen and a dose of castor oil will bring relief; if not, a physician should be called. Colic may be prevented by rubbing the back, from the waist upward (see BABY).

In Animals. Some animals are subject to various forms of colic, especially horses and mules. It is caused usually by hard work too soon after feeding, exposure to cold, too much cold water or undigested food. The symptoms are: turning the head backward, evidences of pain, lying down and getting up frequently, and pawing and striking with the feet. The best remedy is a drench of one ounce of chloral hydrate in a pint of water. Ether and laudanum are also effective.

COLIGNY, or **COLIGNI,** *ko leen'ye,* GASPARD DE (1517-1572), a noble French admiral and Huguenot leader, remarkable for his prudence, bravery and high character, when

the tendency of the times was treachery, murder and selfish ambition. He was born at Châtillon-sur-Loing. At the age of twenty-two he was introduced at court. He won distinction in the wars of Francis I and Henry II, and in 1552 was made admiral of France. As commander-in-chief of the Huguenots after the death of Condé, he exerted every effort in the cause of his religion. Through his influence with King Charles IX he aroused the jealousy of Catherine de' Medici; it was she who urged the massacre of the Huguenots on Saint Bartholomew's Day, and Coligny was the first one put to death. See SAINT BARTHOLOMEW'S DAY, MASSACRE OF; HUGUENOTS.

COLLECT'IVE BAR'GAINING, the system under which employers deal with their workmen as a single body instead of with each individually. Collective bargaining is recognized as one of the most important functions of a trade union, and through it organized labor has achieved most of its success. The employer, instead of negotiating with each of his employees, or determining wages and conditions of work in a one-sided way, makes all arrangements through the business agent, or *walking delegate,* of a union. Collective bargaining, however, is not restricted to agreements with unions, for any agreement between employees or employers as groups falls under this head. In the United States, in Canada, in England and in most other civilized nations, collective bargaining exists in the form of many local trade agreements, and in a few cases there are national agreements. The building trades are perhaps the leaders in using this method. For further details see LABOR ORGANIZATIONS; MINIMUM WAGE; STRIKE. E.A.R.



COLLEGE, a name which in the United States and to some extent in Canada has become confused with *university,* has in reality a distinct meaning.

In the United States. In the best usage the word applies to an institution for higher education which confines its instruction to the so-called liberal arts, that is, science, mathematics, history, literature, etc., giving its members a general education but no special professional or vocational training. Only those schools are truly *universities* which maintain, in addition to the liberal arts department, special departments for teaching some of the professions, such as law, medicine, pharmacy, dentistry, theology, architecture, engineering and forestry, or for research by students beyond that required for the degree of Bachelor of Arts, Bachelor of Science or their equivalents. Some colleges, such as Tufts, which comprises schools of divinity, medicine and dentistry, are entitled to be termed universities, while others unjustly claim this title. A college may be included within a university, as at Harvard, Wisconsin and the like, or it may exist as an independent institution.

The first college in America for higher education was Harvard College, founded in 1636. It was followed in 1693 by William and Mary, by Yale (1701), the College of New Jersey, now Princeton University (1746), and King's College, now Columbia University (1754). The University of Pennsylvania was chartered in 1779 to succeed the college founded by Franklin in 1753.

In Canada. The Canadian use of the word is sometimes similar to the use in the United States. The tendency in recent years is for isolated colleges to become units in a university, but no regard is paid to geographical location; McGill University of Montreal, for instance, has colleges in Vancouver and Victoria, B. C. Some Canadian schools of secondary education are called colleges, and the term *collegiate institute* is sometimes used to indicate a high school of the first rank. The University of King's College at Windsor, N. S., founded in 1790, was both the first Canadian college of higher education and the first Canadian university. Like most of the colleges of the Dominion, it was completely controlled by one religious denomination.

In Europe. The name *college* is in Europe employed only in accord with its historical

significance. Originally the word did not deal with education at all, but referred to any organized group of men, such as a labor union. The College of Cardinals, which elects the Pope, is a typical medieval college. In the twelfth century, first at the University of Paris, then at the English universities, groups of poor students were given aid in return for slight services, and each body, usually about twenty students, was called a college. From these institutions have developed the colleges at Oxford and Cambridge, which are groups of students who sleep and eat together, though mingling in classes with men from other colleges of the university. In recent years many of the English private schools preparatory to the university have been named colleges.

Colleges for Women. Mount Holyoke College, founded in 1837, was the first college for women in the United States. Smith, Wellesley, Vassar and Simmons colleges are the largest of the present-day women's colleges. Barnard College of Columbia University and Radcliffe College, at Harvard, aim to give to women the same instruction that the men receive in their colleges at those universities. E.C.

See UNIVERSITY; COEDUCATION; and the articles on the leading colleges.

COLLEGE, SACRED. See SACRED COLLEGE.

COLLIE, *kol'i,* originally the sheep-dog of Scotland, and now a faithful friend and companion in households everywhere. It is a dog of medium size, about twenty-two inches high at the shoulder, and weighs from forty-five to

THE COLLIE

sixty pounds. It has long, thick hair, with a soft furry undercoat of shorter hair. Black and tan, black and white, tan and white, or all white, with fox-shaped head, ears erect but drooping at the point, and bushy tail curved upward, the collie is one of the handsomest of dogs, and one of the most intelligent. It will take a flock of sheep to pasture, keep them together, protect them from wolves and bring them all back safely at night. Or, alert as a fox, quick as a deer, with intelligence almost human, it will protect its master or his property. A Scotch collie is the hero of one of the best dog stories ever printed, Oliphant's *Bob, Son of Battle.*

COLLIER, *kol'yur,* JOHN PAYNE (1789-1883), an English Shakespearean critic, whose clear right to fame has been obscured by the literary forgeries of which he was guilty. In 1852 he brought out a volume of notes to the text of Shakespeare's plays. He said he had found the notes written on the margins of a copy of the plays bought at a second-hand bookstore. This publication caused intense excitement in the literary world, but the marginal notes were proved to be forgeries, and the deception was publicly exposed by the authorities of the British Museum.

COL'LINGWOOD, a town in Simcoe County, Ontario, on Georgian Bay, seventy miles northwest of Toronto. It is an important port and shipping center, the terminus of one division of the Grand Trunk Railway and the starting point for steamers to Owen Sound, Sault Sainte Marie and other towns. Its harbor, with a depth of twenty feet, is one of the best on the Great Lakes. It has the largest steel shipbuilding yards and dry docks in Canada; some of the largest freight ships of the British Empire were built here. Second in importance is a meat-packing and canning plant, whose capital investment is about $1,000,000. Wire-nail and fencing works, planing and saw mills, foundries and machine shops, fruit and vegetable canneries are among the other industrial establishments. Collingwood is also said to have the largest fruit and vegetable farm in the Dominion. The government fish hatchery, the Carnegie Library, the Y. M. C. A. building and the post office are points of interest. Population in 1911, 7,000; in 1921, 5,882.

COLLINS [WILLIAM] WILKIE (1824-1889), known as the "father of the detective story," was an English novelist. He was born in London, the eldest son of the landscape and portrait painter, William Collins. The name *Wilkie,* by which he is best known, was received from Sir David Wilkie, the painter. Though he spent a number of years in the business world and also studied law, he turned from choice to literature, and when he became acquainted with Dickens he decided to devote his time to writing. *The Woman in White*

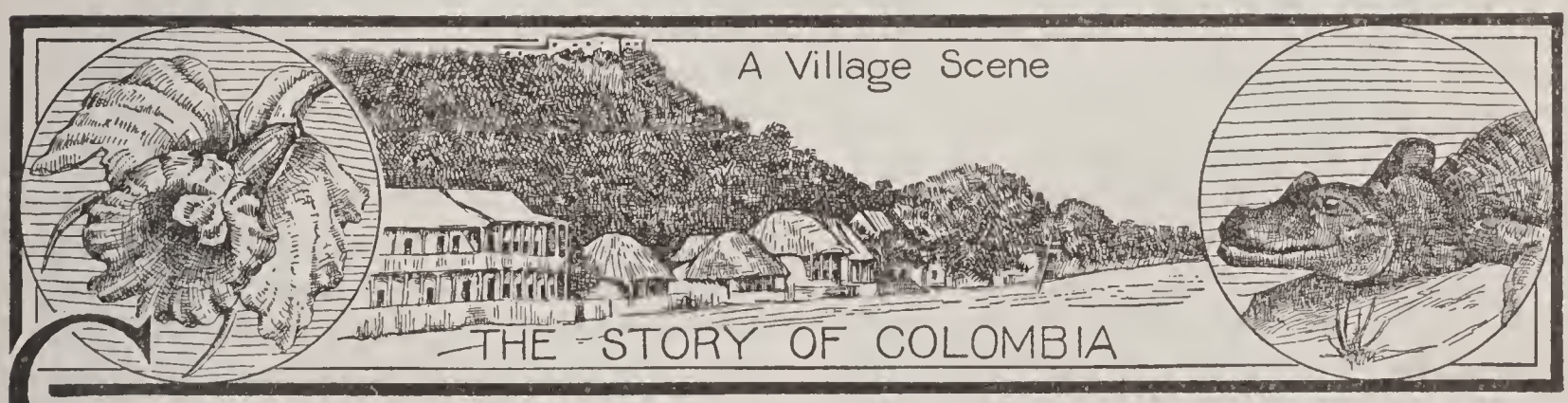
and *The Moonstone,* among his best-known works, are masterpieces of baffling mystery, and although the literary value of these and others from his pen has often been questioned, a number of his novels dramatized were at one time popular on the American and the English stage. He also wrote *Armadale, After Dark, The New Magdalen* and *The Evil Genius.* In 1873 Collins gave public readings in the United States and Canada from his own short stories.

COLOCASIA, *kol o ka' shi a,* a name given to a family of plants more properly known as *caladium,* the "elephant ears" so popular in American gardens planted with cannas and crotons. A native of the East Indies, the colocasia is raised in the tropics as food, for its starchy roots, when boiled, are much like potatoes. The large, shield-shaped leaves, too, are eaten roasted by the natives of the Hawaiian Islands. In most of the Pacific Islands this plant is called *taro;* in Hawaii, *poi;* in Japan, *satoimo;* in China, *yu-tao,* and in Central America, *oto.*

COLOGNE, *ko lohn',* one of the most beautiful and historically interesting cities of Rhenish Prussia, on the left bank of the Rhine. It was in ancient days a town of the tribe of Ubii, but in A. D. 50 received the name of Colonia Agrippina, in honor of the wife of the Roman Emperor Claudius. It steadily grew in importance and eventually became one of the most influential towns in the Hanseatic League (which see). In the sixteenth century its power waned and it did not regain its importance until the beginning of the nineteenth century. The old portion of the city has crooked, narrow streets, arranged without any regard to symmetry. The modern portion is laid out with the precision for which Germans are famous. All public utilities are municipally owned, and the city has extensive manufactures of sugar, tobacco, glue, machinery and several factories producing the famous perfume known as *eau de Cologne.* Population in 1910, 516,167. The German name is *Köln.*

Cologne Cathedral, the chief ornament of the city of Cologne and one of the most remarkable specimens of Gothic architecture in the world. The present structure was commenced in the thirteenth century, on the site of an earlier cathedral which had been destroyed by fire. Early in the nineteenth century it was thoroughly restored. It is in the form of a cross and has the two loftiest towers in the world, each 512 feet high. For many centuries there existed a tradition to the effect that the Three Wise Men who came from the East to view the infant Christ were buried in Cologne Cathedral. The three skulls were exhibited as late as the eighteenth century and were credited with miraculous healing powers. The cathedral is noted for its stained glass windows, its statuary and paintings, and many valuable jewels are kept in the cathedral treasury.

For illustration, see article CATHEDRAL.



COLOMBIA, formerly known as NEW GRANADA, a republic in the northwestern corner of South America which for a long time included within its area the present republic of Panama. It is a vast land of plains, or *llanos,* table-lands and mountains, the plains comprising more than half of the territory. Colombia is so called in honor of Christopher Columbus, who explored a section of the country in 1502. It has an almost unbroken coast line of over 3,600 miles, more than 1,600 of which are on the Pacific. As the southern boundaries are disputed by the two neighboring countries, Ecuador and Peru, the area of Colombia is not definitely known, but 440,840 square miles is the estimated figure.

This republic of very irregular shape has an area as large as that of the south-central portion of the United States, consisting of Texas, Oklahoma, Arkansas and Louisiana; it contains over 30,000 square miles more than the great province of Ontario, after its enlargement in 1911. Still, in such a country, rich in natural resources, live but 5,855,077 people, exclusive

of about 30,000 uncivilized Indians—only about eleven people to the square mile, and 300,000 fewer than in the city of New York alone. Difficulties of transportation and communication must still be overcome before advantage can be taken of the riches and fertility which abound.

The People. The southern and southeastern plains, or llanos, are still inhabited by uncivilized Indians of tribes which formerly inhabited all Colombia. The civilized population is concentrated in northern and western portions,

LOCATION MAP

Showing, also, the proportion of the continent occupied by the republic.

mostly on the high table-lands from 3,000 to 9,000 feet over the sea level, where the climate is temperate or cold all the year around. The religion of the republic is Roman Catholicism, but other forms of religion are permitted. The population is singularly diversified. Ten per cent of the people are of pure Spanish blood, imbued with the characteristics of the ruling class of Spain. The Indians of unmixed blood constitute fifteen per cent, and some of them still speak their native languages; most of the other tongues have become extinct. Forty per cent of the population is a mixture of Spanish and Indian, and twenty-five per cent is made up of negroes and negro mixtures. The latter divisions constitute the laboring class. The people of mingled Spanish and Indian blood are generally the small traders and farmers. The seclusion of the inhabitants of the mountain cities, by reason of the difficulties of travel and transportation, has been productive of conservation of the old Spanish mode of life and habit of thought. This is seen in home furnishings, forms of courtesy, taste in literature and in art, in amusements and in many old-fashioned virtues.

Cities. The principal cities are Bogota (143,994 inhabitants), the capital, the city of perpetual spring; Medellin (79,146 inhabitants), in the gold center; Barranquilla (64,543 inhabitants), a river port of industrial development, and Cartagena (51,382 inhabitants), a seaport. Over six per cent of the population of the republic live in those four cities; the most important are described under their titles in these volumes. Census figures of 1918 are given.

Education. Free education, which is not compulsory, is largely maintained by the state. There are over 5,350 primary schools, with nearly 350,000 pupils. Most of the 301 schools, with 25,500 pupils, for secondary education, are maintained by the state, but are directed by religious orders. The oldest university is at Bogota. Besides there is a school of mines at Medellin, and there are thirty-six schools of arts and trades. A national library, museum and observatory are maintained at Bogota, and smaller ones in the principal cities.

Commercial Opportunities. The difficulties of transportation in the mountain regions, the disinclination of the whites to manual labor and the reluctance of their proud families to engage in petty trade have up to this day worked in restricting commerce. Unskilled labor is abundant, and the mestizos have a relish for trade; and by an extension of their acquaintance with all classes in this strangely-mixed land, North Americans will find multiplied opportunities for trade and investment in Colombia when the resentment against the United States, caused by its interference with the attempted suppression of the Panama secession, shall have been overcome. If up to the present the Colombian people have shown themselves somewhat reluctant in trying to obtain the help mentioned, it is only due to the fact that various treaties pending at different times between Colombia and the United States have come to naught.

There are new lines for the development of American commerce, the scope of which cannot be measured, but may safely be stated as

enormous. Mining (gold, coal, oil, copper), the establishment of packing houses near the coast, and especially the building of railways and dredging of rivers are the most immediate items for investment. In fact, Americans have just now in Colombia the same opportunities that the English had and so cleverly took advantage of in Argentina from 1860 to 1880, and which made them the leading factor in that country's progress (see PANAMA, REPUBLIC OF).

Physical Features. One-third of Colombia is mountainous land, with only pack train transportation. The eastern and southeastern half consists chiefly of well-watered, treeless plains, or llanos, adapted to pasturing, swarming with cattle, but as yet sparsely settled. Crossing those plains are the rivers Guaviare and Meta, branches of the Orinoco River, which forms part of the eastern boundary; and the rivers Uaupes, Apoporis, Caqueta, or Yapura, and Putumayo, branches of the Amazon. South of the plains lies a tropical forest belt, the most useful trees of the region being rubber trees.

In the central and western half of the republic are concentrated the principal wealth of the country and the bulk of the population; but it is a mountainous section, whose fertile uplands are of difficult access in spots. There, running from south to north, are three ranges of the Andes Mountains, continuations of ranges in Ecuador. The western range, the Cordillera Occidental, or "de Choco," rises to heights of from 10,000 to 12,000 feet, dividing at the north and extending in one direction into the republic of Panama; in the other, ending in the llanos of Bolivar, near the Caribbean Sea.

The central range, the Cordillera Central, or "de Quindio," was so named because crossing its central portion is the famous Quindio Pass, which connects Cartagena and Ibague. This range has the highest peaks in Colombia, several of which are lofty volcanoes, some active, some semi-active and others extinct. Tolima, the highest volcano, rises 18,400 feet above sea level. Huila and Purace are nearly as high.

The eastern range, the Cordillera Oriental, is free from volcanoes, and its highest elevation is 16,700 feet. There lie the great temperate table-lands which form the most thickly-populated portion of Colombia. Disconnected from the Andes there is an isolated range running parallel with the Caribbean Sea in the department of Magdalena. It towers into the Sierra Nevada of Santa Marta, which is covered with perpetual snow, and whose summit rises, as if emerging from the ocean, to a height of 19,000 feet. Important American settlements, banana and coffee plantations are established on the slopes of the Sierra. Dividing the eastern range from the central, is the great valley of the Magdalena River, commercially the most important river of the republic, and in length and volume of water the fourth river of the continent. It flows north to the Caribbean Sea, and is navigable for nearly 850 miles of its 1,000 miles of winding length. There is just one break in its even course, 600 miles from its mouth, at the rapids of Honda. These extend for twenty miles and are overcome by a railway.

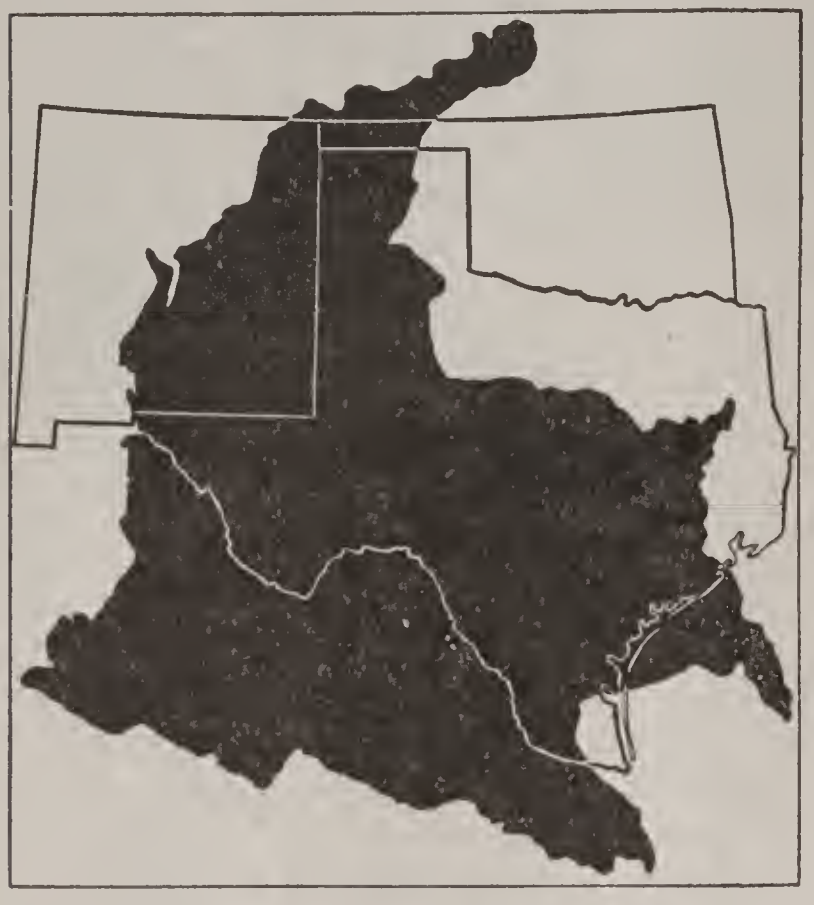
All the mountain slopes are thickly forested, cedars, hard wood, guayacan, mahogany, splendid fine woods, chinchonas, aloes and sarsaparilla trees being found in abundance. In this western section, too, in the regions adapted to their modes of life, are found several kinds of serpents, a few species of monkey, jaguars, pumas, tapirs, anteaters and deer. Lending touches of bright color to the forest greens are humming birds, parrots and fruit-eating toucans; and flying high are condors and vultures. On the northern (Caribbean) coast are the two best harbors, Cartagena and Barranquilla. On the Pacific side are natural harbors in the bays of Cupica, Nuqui, Malaga, Choco and Tumaco.

Climate. Within a day in the republic of Colombia one can experience almost the extremes of temperature. From a place of intense heat in the valleys one can rise to a table-land of almost perpetual spring. Then climbing the mountains and rising above the timber land, about 10,000 feet above the sea, a zone of severe cold and perpetual snow would be reached. The greatest heat is experienced in the belt south of the plains. The upper regions of the mountains have a pleasant climate and abundant rain. On the coast is a region of heat and rains throughout the year.

Agriculture. Although agriculture is the chief industry of Colombia, only a small section of the country is under cultivation, from want of means of transportation and communication. Primitive methods are still employed. In the hot regions coffee, tobacco, sugar cane, cotton and cacao are the important crops; most of the ordinary coffees are sent to the United States, the finest qualities going to Europe, and the greater part of the tobacco

is shipped to Germany. The cotton is sent to Liverpool and Havre.

In the temperate western plateaus, potatoes, wheat, corn and barley are grown, but the crop is not sufficient to supply the entire home demand. Wheat is imported from the United States and rye from Germany. Banana culti-



COMPARATIVE AREAS

Colombia compared with Texas, New Mexico and Oklahoma.

vation is extending, and about a million dollars' worth of the fruit is sent to the United States yearly. Hevea (rubber) trees and tolu balsams are cultivated for their products, though also found in large quantities. Wild copaiba trees are likewise tapped. Dye-woods and cedars are abundant on the Magdalena River, but little lumber is exported. Inexhaustible tracts of mangrove are found on the coasts. Cattle-raising is an important industry, and about two and a half million dollars' worth of hides are exported to the United States each year.

According to the "Summary of Foreign Commerce of the United States," there were exported from Colombia in 1920 products of a value of $72,000,000, the principal items being coffee, $42,000,000; hides, $3,500,000; bananas, $1,650,000; Panama hats, $1,587,000. The balance was furnished by cocoa, India rubber, ivory, nuts, etc. In the very near future live cattle and meat will be sent also from Colombia, where packing houses are being established.

Mining and Manufactures. Colombia is rich in precious metals, and nearly all the fine emeralds mined to-day come from mines in that republic. Two emerald mines (at Muzo and Cosquez) belong to the government, and they yield about $1,500,000 worth of stones yearly. In the production of platinum Colombia is next to Russia.

Gold and silver abound in the mountainous regions. The chief centers of gold-mining are Antioquia and Cauca. The centers of silver-mining are Tolima and Cauca. The annual output of gold and silver is valued at $6,000,000, an average of $20,000 each working day. The platinum exported each year is valued at almost $600,000. Other minerals which abound, but which are little developed, are copper, mercury, cinnabar and manganese. It is interesting to note that salt mines, north of Bogota, the capital, are a government monopoly and a great source of revenue. Coal and petroleum exist in extensive deposits and have begun to attract the attention of American and British capital. Iron works, north of Bogota, manufacture wrought iron, rails, castings, etc., and large steel mills are to be established at Pradera. There are valuable pearl fisheries on the coasts, obtainable through temporary contracts from the government.

Although manufacturing industries are still of little importance, great strides are being made in the manufacture of Suaza or Panama hats from *jipijapa* and *toquilla* fiber; in 1920 the hats manufactured had a value of $1,587,000. At Barranquilla, the northern seaport, are a great number of factories for the making of matches, glassware, shoes, nails, cotton-goods and ice.

Transportation and Communication. Although much of the inland traffic is by river on the Magdalena and its branches, most of the commercial intercourse must be carried on over simple mule tracks and cart roads, for there are only 708 miles of railway. The lines are short, from twenty-five to a hundred miles in length, and form no connective means of travel. The 14,500 miles of telegraph lines are owned by the government. Colombia is in communication with America and Europe by cable and regular lines of steamers. Colombia has developed no important seaports on the Pacific (its principal city on the western coast being Buenaventura, with a population of little more than 4,000), since to reach this coast from ports on the North Atlantic has necessitated, until recently, the immense journey around the continent. Likewise, Colombian ports on the Caribbean have been barred until recently, by the Isthmus of Panama, from a

direct sailing route to the ports of the Pacific. Since all the Colombian seaports are so near to the Panama Canal, Buenaventura and possibly other Pacific ports may develop into importance, from their new accessibility.

Government. The present fourteen "Departmentos," three "Intendencias" (intendencies) and seven "Commissaries" of the republic of Colombia are governed under a central constitution. A President is elected for a term of four years, by direct vote, and may not serve two terms in succession. Congress elects two substitutes for a term of one year, one of whom would fill a vacancy during a Presidential term.

Legislative power rests with a Congress composed of a Senate and a House of Representatives. The Senate has one Senator for each 120,000 inhabitants, elected indirectly by electors chosen for the purpose, and serve four years. The members of the House of Representatives, one for each 50,000 inhabitants, are elected by direct vote of the people, for two years. Governors of the "Departmentos" are appointed by the President of the republic. A Cabinet of eight Ministers, appointed by him, assists the President. Every able-bodied man in Colombia is liable to military service, but service is not generally enforced. A Supreme Court, with nine judges, four appointed by the Senate and five by the House, district supreme courts and provincial courts administer justice.

History. From 1499 to 1536 the coasts of Colombia were explored at various times by Ojeda, Bastida, Columbus, Balboa, Pizarro, Heredia and Almagro. Between 1536 and 1540, united forces of Spaniards overcame the Indians occupying that region and Spanish settlements rapidly grew. Until 1718 it was known as the province of *New Granada.* It was then made a vice-royalty.

The great leader, Simon Bolivar, a native of Caracas, having overthrown the Spanish power in Venezuela, began the liberation of New Granada, which was united with Venezuela and Quito, Ecuador, under the name of the *Republic of Colombia,* by the constitution of 1819. General William Henry Harrison, afterward President of the United States, was sent as American minister to the new republic, which was welcomed with enthusiasm into the family of nations. But dissensions arose. Venezuela and Ecuador seceded in 1830, the year of Bolivar's death, leaving only New Granada to represent the republic on which high hopes had been built (see BOLIVAR, SIMON).

Outline and Questions on Colombia

I. Position and Size

(1) Latitude, 3° south to 12° 30′ north
(2) Longitude, 67° 30′ to 83° west
(3) Actual area, 468,000 square miles
(4) Comparative area

II. Physical Features

(1) Distribution of mountains and plains
(2) Rivers
(3) Vegetation
(4) Climate

III. Industries and Transportation

(1) Agriculture
  (a) Distribution
  (b) Chief crops
(2) Mining
(3) Manufacturing
(4) Transportation and commerce

IV. The People

(1) Races
(2) Numbers
(3) Education and religion

V. Government and Religion

(1) Republican form of government
(2) Departments
(3) Early conquest
(4) The work of Bolivar
(5) Civil struggles
(6) The Panama question

Questions

How great a variation in climate may be experienced in one day's traveling?

How has one of the greatest engineering projects ever undertaken by the United States brought it into conflict with Colombia?

What products of Colombian industry are eagerly bought by Americans?

Who was the hero of the struggle for independence? What other South American countries owe their liberty, in whole or in part, to him?

For whom was the country named? Did he ever actually see this part of the world?

What tendencies of the people have interfered with the development of trade?

Why has not agriculture become more widespread and important? Of what crop does the United States receive the poorer grades?

What are the chief elements of the population?

Where is the bulk of the population located?

How long a stretch of railway has the country for each hundred square miles of its territory?

What city of the United States has a population larger than that of this entire country?

Of what valuable mineral resource does the government hold the monopoly?

What effect is the Panama Canal likely to have on the trade of Colombia?

Civil war raged from 1825 to 1841. A reformed constitution in 1843 promised better things. Slavery was abolished in 1852. A new constitution, in 1863, restored, under Federal reform, the old name of Colombia—"Estados Unidos de Colombia"—and reduced the Presidential term to two years. In 1866 a new central constitution was adopted, destroying the Federal one, and the Presidential term was extended to four years.

In 1903 Colombia rejected the Hay-Herran Treaty with the United States for the concession of the ship canal right-of-way through the Isthmus of Panama to the latter country, demanding a vastly greater payment for the concession. On November 3 a revolution broke out in the city of Panama, and the new republic of Panama was recognized by the United States four days later. United States marines were landed for the protection of property and the preservation of order, and Colombia was not permitted to attempt the subjugation of the new republic. The suddenness of the movement and the fact that the United States had long guaranteed to Colombia the possession of Panama, caused great indignation among the Colombians; they were later paid $25,000,000 for their loss. R.A.

Other Items of Interest. Almost all the money in use in Colombia is paper money, and since a paper dollar, or *peso,* is worth a little less than a cent, a traveler who pays for an article with a twenty-dollar gold piece and receives ten or fifteen dollars in change is likely to be embarrassed by its bulk.

The forests of Colombia abound in orchids, and collectors from Europe and North America gladly brave the dangers to obtain the gorgeous specimens. An especially rare one has been known to sell for as much as $6,000.

The natives use a picturesque boat called a *champan,* which is so heavy that fifteen or eighteen men can with difficulty pull it against the current.

Colombia's greatest natural beauty is a waterfall almost five hundred feet in height, which is located about twenty miles from Bogota.

Barranquilla, the chief commercial city, has wide, unpaved streets on which the sand lies thick.

The government owns and operates the telegraph lines, and a message of ten words may be sent to any part of the country for ten cents. Beyond that, charges increase rapidly, the eleventh word costing two cents, the twelfth three, the thirteenth four, and so on.

Cartagena is the finest example in the western hemisphere of the old walled cities of the Spaniards. In some places the wall is forty feet thick, and when, during a civil war in 1904, it received the fire from a man-of-war, it turned the cannon shot as easily as, centuries ago, it turned the fire from the Spanish muskets.

Consult Thomson's *Colombia and the United States;* Petre's *The Republic of Colombia.*

COLOMBO, *ko lohm' bo,* a city of great commercial importance, the capital and chief seaport of Ceylon, on the west coast of the island. Its immense breakwater, sheltering 500 acres of water, makes it the shipping point for most imports and exports of the island. It is the center of Ceylon's tea and cocoanut industries. The population, which in 1921 was 244,100, is distributed over two distinct parts. The European portion is noted for the beauty of the buildings, roads and gardens. The native portion, or *Pettah,* is a place of crooked, narrow, ill-kept streets.

Nobody knows when the first settlement was made here. The town, under an Indian name, was mentioned as early as 1345 as the finest settlement in India. It was captured by the Dutch in 1656, and in 1796 by the British, who yet possess it in connection with all British India.

COLON, *ko lohn',* a seaport of Panama, the northern terminus of the Panama Canal. It is interesting to note that Colon, on the Atlantic side of the Canal, is twenty-two miles farther west than Panama, the southern terminus, on

LOCATION OF COLON

the Pacific side. In matters of sanitation and quarantine Colon is under the jurisdiction of the United States, but for all other governmental purposes it is a part of the Republic of Panama (which see). Adjacent to Colon, however, and practically a part of that city, is

Cristobal, an American town, the eastern terminal headquarters for the great Panama enterprise of the United States. There are located the shops of the Panama Railroad and a wonderful cold storage plant of the Isthmian Canal Commission.

Colon has an extensive harbor accommodation, and although it had an important transit trade before the Panama Canal was begun, the place has since been transformed. A long breakwater was erected, and the city is now a port of call for over a dozen lines of steamers. From a population of about 3,000 negroes and Spanish-speaking natives of mixed blood, Colon grew to a population in 1917 of 26,076 through the work of the Panama Commission. From a place of filth and disease it has developed into a city of wide, regular streets, better homes and good sanitation, due to the work of the sanitary engineers of the United States army, under Colonel (later Major-General) Gorgas.

For a number of years Colon was called *Aspinwall,* in honor of William H. Aspinwall, one of the six New York promoters of the Panama Railroad in 1849. These men founded the town in 1850.

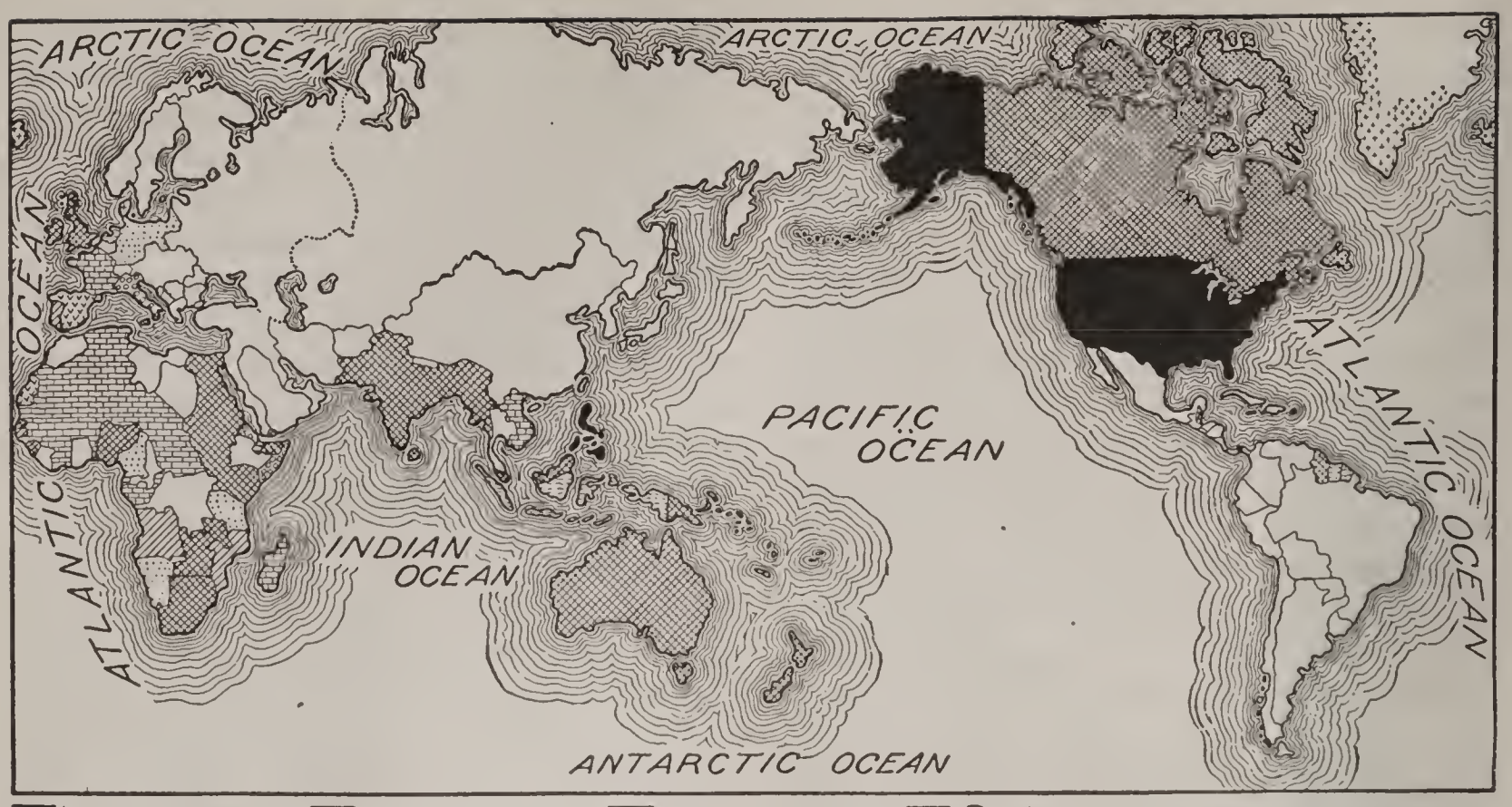
COLONEL, *ker'nel,* the title of a military officer, borne in the United States army by an officer who holds rank between lieutenant-colonel and brigadier-general. The corresponding rank in the navy is that of captain; the pay of a colonel ranges from $3,000 to $4,000 a year, determined by length of service. A colonel is the commanding officer in a regiment of cavalry or infantry, and there are also colonels in charge of artillery corps. Staff colonels, who hold no command, are assigned to the various staff corps; that is, to the several departments or bureaus into which the War Department is subdivided, such as the medical, pay and engineering corps. In the English army the title of colonel is held by the officer in active command of artillery and engineers. See RANK.

COLO'NIAL DAMES OF AMERICA, a patriotic society of women, who, following their original purpose, have done much toward the preservation of places and things of historical interest which otherwise might have been destroyed. This society was organized in 1890 in New York City in commemoration of the success of the Revolution, and to collect manuscripts, traditions, relics, etc., of colonial and revolutionary times. Membership is obtained only on invitation of one already enrolled, and is restricted to women directly descended from a distinguished ancestor who resided in America in colonial times. One of the most interesting and valuable collections of the society is in Van Cortlandt Park, New York City.

COLONIES, *kol'o niz,* **AND COLONIZATION.** The word *colonist* is derived from two Latin words meaning *a farmer* and *to cultivate.* Even in the days of early history the resources of a country were sometimes in danger of becoming exhausted as the population increased. Added to the necessity of acquiring more land on which to raise necessary crops for food, was also that desire for expansion which is implanted in the ambitious human breast. The result was that bodies of men in various nations set out in search of new lands which they might cultivate while still enjoying the protection of the mother country. The object was not necessarily to found a new nation, but to go out into the world where opportunities were greater and new land awaited the plow. These men were strictly *colonists.* They set out to cultivate the soil and develop commerce and defense. There is a considerable difference between a country that is *colonized,* and one that is subject only to *military occupation.* The term *colony* is now often mistakenly used for *possession.*

Within comparatively recent years colonization has become of vital importance to most of the world's nations. Many nations have a surplus of population, which must somewhere find an outlet. Year by year it becomes harder for any country to be self-supporting. In this respect most of the American countries have great advantages. Their resources are unimpaired; their population is not overcrowded; colonies are not yet needed. It is otherwise with European nations. Europe has been overcrowded for centuries, and year after year sons and daughters of its countries have gone forth to seek in new lands what overcrowding denies them at home.

The Greeks were ahead of all other nations, ancient or modern, in the fine art of colonization. Their colonies became flourishing commercial centers, and in time assumed such importance as to rival Greece itself in power and culture. The Romans established military posts only, and their influence over conquered territories lasted only as long as their military occupation. Britain can show little of the results of Roman conquests and less of Roman colonization. The Normans also conquered Britain and were promptly absorbed by the



HOW THE WORLD IS APPORTIONED

Germany lost its colonies in the War of the Nations, and they are to be governed by the former allied countries, at least for a period of years.

Anglo-Saxon element. The lands of the world are now so much divided among nations that there is comparatively little room for colonization. There are no more virgin countries to be appropriated, although there are vast spaces under existing governments for new settlers.

Colonies of the World. The articles on the great countries contain lists of their colonies, with areas and population. In addition, supplementary lists, divided according to continents, will be found with the political maps of the various grand divisions. F.ST.A.

COLOR, *kul'er,* cannot be studied or understood apart from light, for color is a property of light, just as pitch is a property of sound. Many years ago people believed that of all the known colors white light was the simplest and purest, but the great scientist, Sir Isaac Newton, disproved this by an interesting experiment. He admitted a beam of sunlight through a small aperture in the shutter of a darkened room, and let the beam pass through a glass prism to a white screen. On the screen there appeared not the colorless image of the sun, but a band of many colors, arranged in the following order—violet, indigo, blue, green, yellow, orange, red. Such a band of colors is called a *spectrum.* Newton proved by his experiment that white light is a mixture of all the colors of the spectrum; these same colors appear in beautiful form in the rainbow, which is produced when the sun shines on raindrops. The drops act like tiny prisms, and separate the rays into the seven colors by refraction.

Scientists have learned many other interesting facts about color. Light waves, they tell us, have different lengths, and each color corresponds to a certain wave-length. The waves that produce the sensation of red light are about twice as long as those that produce violet, which is the first color in the spectrum. A piece of white paper has no color because it reflects all wave-lengths equally, but a piece of red cloth looks red because it reflects only those waves that produce red light, and it absorbs the others. A black object, on the other hand, absorbs nearly all colors. Now we may see why the sky looks blue in the daytime. In the atmosphere are many tiny particles of dust, which reflect the blue waves and permit the others to pass. Were the air entirely free from dust specks it would look dark.

Color Everywhere. A world without color! Who can imagine it? We could as easily picture a world without light as a world without color. In our homes we are surrounded by color. In the street we see color in every object. In our hours of work and play, in the town, in the country, in shops and factories, in churches, schools and playgrounds, in the parks and on the river, on the sea and in it, in the clouds and stars, and even in the air we are ever

COLOR CHART

COLORS IN FULL INTENSITY AND GRAYED COLORS

3 PARTS YELLOW ADDED TO	+	1 PART VIOLET	=	MAKE GRAY YELLOW
3 PARTS ORANGE ADDED TO	+	1 PART BLUE	=	MAKE GRAY ORANGE
3 PARTS RED ADDED TO	+	1 PART GREEN	=	MAKE GRAY RED
3 PARTS GREEN ADDED TO	+	1 PART RED	=	MAKE GRAY GREEN
3 PARTS BLUE ADDED TO	+	1 PART ORANGE	=	MAKE GRAY BLUE
3 PARTS VIOLET ADDED TO	+	1 PART YELLOW	=	MAKE GRAY VIOLET

in a world of color. The teamster with his cart and horse, the driver with his auto-truck, the packing-case on the sidewalk, the letter-box on the lamp post, the postman with his mailbag, the farmer in his fields, the cows grazing in the pasture, the trees on the hillside, the road across the meadows, all appear to us as color shapes.

How to Use Color. We cannot make colors as beautiful as those of the rainbow, but we can imitate or represent these colors with *pigments*. Pigments are coloring matter, and are found in many places. Some pigments come from the earth, and we obtain them in clay banks and mines. Yellow ochre is a pigment of the first kind, and cobalt blue comes from minerals. Plants and trees provide us with many dyestuffs and pigments, and the great group of aniline dyes is obtained from coal tar.

We cannot use pigments just as we find them. If, for example, we should spread yellow. ochre on a house, the first rain would wash it off. Pigments must be mixed with something to make them adhere. If we mix yellow ochre with linseed oil, we form oil paint, which is permanent. If we mix yellow ochre with glycerine and gum arabic, we form a substance which will dissolve in water. This we call water-color paint. If we mix yellow ochre with chalk, we form colored crayons and pastels. In all these mixtures, the pigment is the same, but the mixing medium determines the kind of paint formed.

Since color is so universal and since we cannot escape from it, even if we would, it is of the greatest importance that we understand the laws that govern the use of color. We cannot pick out a suit of clothes or a necktie, a dress or a hat, without exercising a choice of color. What can help us to make the right choice?

It is knowledge of color combinations and harmonies. The color chart can be used as an aid in the study of color, just as the piano is used in the study of music. If we strike but one note on the piano, we do not produce music; but if we strike at the same time two other notes related to the first note, we produce a harmony of sound which we call a chord. So, with the color chart, if we select from it any one color, as for instance, blue, we do not obtain harmony; but if we take that same blue as one note, and use with it two other related notes, as a lighter blue and a darker blue, we obtain a color chord. Let us study the color chart and use it as a guide in our selection of colors for any purpose.

There are three colors, yellow, red and blue, which are, in pigments, the sources of all other colors. That is, from mixtures of these three colors all other colors are obtained. For this reason, yellow, red and blue are called *primary colors*.

The union of any two primary colors produces a new color called a *binary color* (*binary* means *made from two*). That is, the union of yellow and red produces the binary orange; the union of yellow and blue produces the binary green; the union of red and blue produces the binary violet, or purple. Orange, green and violet, then, are called the binary colors.

A color *hue* is the step between a primary and a binary color. In the color chart you will notice that yellow appears at the top of the circle. Between the primary yellow and the binary orange (on the left) you will see a color that is made of a mixture of these two. It is the hue yellow-orange. Between orange and red is the hue red-orange. Between red and violet is the hue red-violet. Between violet and blue is blue-violet. Between blue and green is blue-green, and between green and yellow is yellow-green. This completes the color circuit.

The colors that you see in the outer circle of the color chart are as bright as they can be made with pigments. They are called colors *in full intensity*. Any tone of red, for instance, that is lighter than red at full intensity, is a *tint* of red. Any tone of red that is darker than red at full intensity is a *shade* of red. People often confuse the two terms *tint* and *shade* in speaking of the different tones of a color.

There are certain colors that seem to strengthen or emphasize each other when they are seen together. Such colors are said to be *complementary* to each other. In the chart the colors are so arranged that color complements are opposite each other. Yellow, for example, is placed opposite its complement, violet; red is opposite its complement, green; blue is opposite its complement, orange; yellow-orange is opposite its complement, blue-violet; red-orange is opposite its complement, blue-green; and red-violet is opposite its complement, yellow-green.

Although when *seen* together complementary colors emphasize and strengthen each other, when *mixed,* as in using water or oil colors, they produce the opposite result. That is,

yellow mixed with a little violet will produce a grayed yellow; red mixed with a little green will produce a grayed green; and blue mixed with a little orange will produce a grayed blue.

It is this mixture of complementary colors which has produced the second circle of colors in the chart, marked gray-yellow, gray-orange, gray-red, gray-violet, gray-blue and gray-green. When equal quantities of these complementary colors are mixed, the pure, or neutral, gray found in the center circle is produced.

How to Use Color Knowledge. Now that we know what is meant by primary and binary colors, by hues and by the tints and shades of all colors, by complementary colors, and how they affect each other when mixed, how can we use our color knowledge? We must learn what colors can be depended upon to look well, when used in house decoration, in dress design, or in any other practical way.

If we wish to use any one color in full intensity, as a green feather on a hat, we should be sure to use it with black, white or gray. If we wish to paint the shutters on a house bright green, we should paint the house light gray or white. If we wish to use blue and orange in a costume, we must use a small quantity of the intense color, as a bright orange tie, buckle, flower or bit of trimming, with a large mass of grayed blue for the main part of the costume.

While complementary colors can be depended upon to produce harmony, they should seldom be employed in full intensity, except where brilliant or startling effects are desired, and even then they should be combined with black, white or gray.

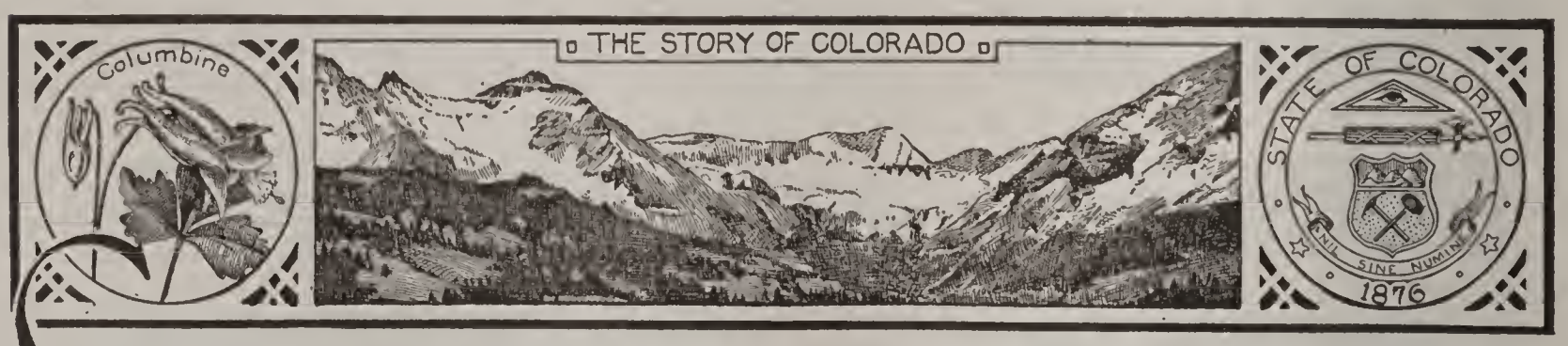
Tints and shades of any one color are sure to be harmonious when used in a costume or in house decoration. Here, again, touches of black or white, or both, will add much to the interest. For example, a costume in tones of blue will be improved by some addition of white; a room in tones of buff could carry a trim of white paint; a dark blue suit of clothes looks well when worn with a white shirt, a white or straw hat, and a black tie.

Other groups of colors that can be depended upon to produce harmony are the neighboring, or analogous, colors. For example, yellow, yellow-green and green in their tints and shades might be employed in the color schemes of fabrics, for curtains, pillow covers, carpets and hangings. Yellow, yellow-orange and orange are brilliant and showy and could be used in window dressing, in flower arrangements and in millinery. Red-violet, violet and blue-violet could be applied in the designing of silks and velvets. Additions of black and white to all color combinations are generally desirable; light tints call for a touch of black.

You will see how practical and valuable a knowledge of color combinations may prove to those who desire to study color. The color chart is a sort of compass, to be used in sailing through the sea of color by which we are surrounded. B.S.

Related Subjects. The following articles in these volumes contain much information which will be found interesting and helpful in a study of the topic of color:

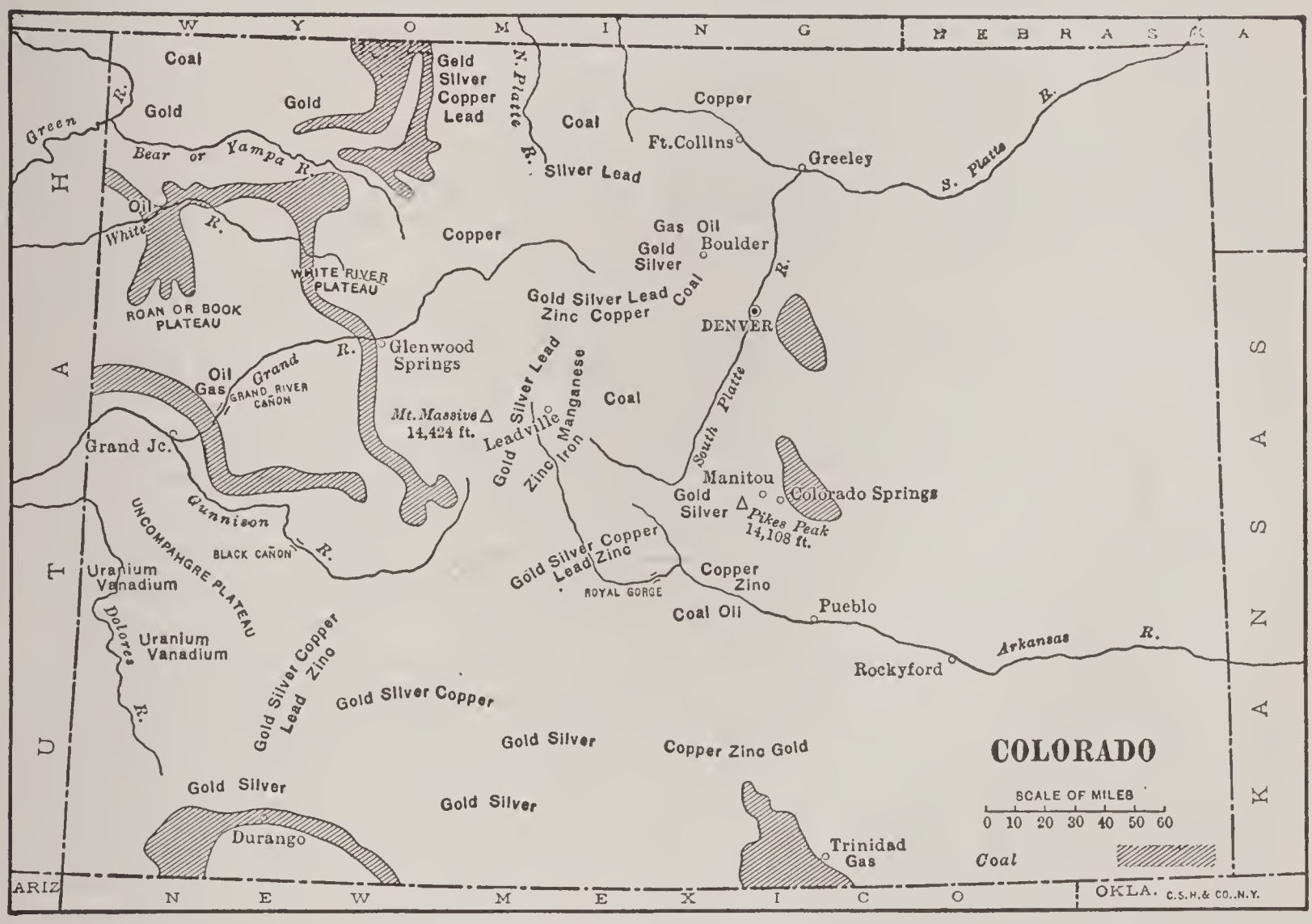
Aniline
Black
Blue
Brown
Carmine
Chrome
Coal Tar
Costume
Green
Indigo
Interior Decoration
Lake
Light
Ochre
Orange
Purple
Rainbow
Red
Sepia
Spectrum Analysis
Ultramarine
Umber
White
Yellow



COLORADO, one of the Western states of the American Union, called *The Centennial State* because it was admitted in 1876, the hundredth anniversary of American independence. It forms a great quadrilateral, and save for Wyoming is the only state that is bounded by four straight lines. With an east and west length of 375 miles, a north and south breadth of 276, and an area of 103,948 square miles, it is the seventh state in size, but its population of 939,376 in 1920 makes it but thirty-third in number of inhabitants. Its state flower is the columbine, often wrongly called wild honeysuckle.

The People and the Cities. Colorado's population of 799,024, as announced by the Census Bureau in 1910, was greater than that of any other Rocky Mountain state, and its capital, Denver, is the metropolis of the whole mountain and plateau region. The growth in population in the state has been steady but not phenomenal, and the increase is still going on so rapidly that the last official returns are doubtless below actual conditions. For a long time, as is usual in any mining state, the vast majority of the inhabitants were men, but as boom conditions have given place to a settled industrial development this proportion has changed until to-day the men comprise but little more than half of the population. There are fewer than 1,500 Indians left in the state, but the number does not seem to be decreasing. In 1910 there were 7.7 people to the square mile, but it is estimated that in 1917 there were more than 9. Over twenty-six per cent of the people live in Denver.

Over fifty per cent of the people live in cities or towns, and this urban population is increasing more rapidly than the rural. There are not, however, very many large cities, only eight having a population of more than 4,000. Denver, the capital, is the largest city and the railroad center of that part of the United States. Other important cities are Pueblo, the chief market of the grazing region, Colorado Springs, the most popular scenic and health resort in the state; Trinidad, the center of the largest coal-mining region; Boulder, the seat of the state university; Leadville, a center of silver production, and Cripple Creek, the famous gold-mining town. The two towns last named were smaller in 1910 than they were a decade earlier, because of the exhaustion of certain large silver and gold mines. Each city is more fully described under its title.



OUTLINE MAP OF COLORADO

Showing boundaries, rivers, principal cities, mineral deposits and highest point in the state.

Surface Features. This is a more interesting topic in connection with Colorado than with most states, for it is to its surface features that Colorado largely owes its great fame as a resort state. Except California, it is probably visited by more tourists annually than is any other state, and these with one accord admire the wonders of the mountain country. Only one state, Wyoming, lies higher than does Colorado, which is crossed by the Great Divide, that dominating height of land which separates the eastward-flowing rivers of North America from the westward-flowing.

Not all of the state is mountainous. The eastern division, which includes about one-third

of the area, is a part of the central Great Plains, and a continuation of the vast prairie region. Rising gradually from an elevation of 3,000 feet or thereabouts at the eastern boundary, it meets the foothills of the Rocky Mountains at a height of about 6,000 feet. At places the foothills rise very abruptly, and the picturesque scenery begins here. To the west tower the Rockies, range on range. In the Front Range, which forms the eastern ramparts of this great system, are the loftiest of the Rocky Mountain summits, and the scenery throughout the whole region is inexpressibly beautiful. There are, it is estimated, in the neighborhood of 300 peaks over 13,000 feet in altitude within the state, and almost fifty over 14,000 feet. Pike's Peak, which ranks in altitude twenty-fifth in the list of named peaks, is by all means the most famous, because of its accessibility, but Mount Elbert (14,421 feet) and Mount Massive (14,424 feet), are the highest.

West of the Front Range is the Park Range, named for the high valleys or "parks" which it encloses. These are formed where some cross range intersects a great valley, and some of them are of considerable extent. San Luis, South, Middle and North parks are at a height of from 7,500 to 9,000 feet above sea level and range in size from 2,200 to 8,000 square miles. The largest of them, San Luis, is almost equal in area to New Jersey or Massachusetts. Well-watered and fertile, clothed with trees and grass, these constitute valuable agricultural regions. Some of the smaller parks are favorite summer resorts, and with their rich green grass and borders of towering, snow-crowned mountains are unmatched for sublimity anywhere else in the United States. Most famous of them is the Garden of the Gods, with its curious rock formations of red and white.

The third division, to the west of the Great Divide, is a high plateau, with mountain masses rising from it. Barren through much of its extent of vegetation, this region is yet extremely picturesque, for swiftly-flowing streams, some still to be seen and some long vanished, have carved it into canyons and *mesas* of strange form and brilliant colors.

Plants and Animals of the Mountain Region. The mountains do not suffer as do the lowlands from a dearth of trees. Most of them are wooded well up toward the snow line with pines and other cone-bearing trees, and the lumber products of these high regions are of considerable importance. But in many places it has been estimated that the trees are of more benefit standing than in the form of lumber, for since they grow all about the river-sources they do much to protect the drainage basins. The Federal government, therefore, has established a number of forest reserves, and in those sections lumber-cutting is permitted only under strict supervision.

Time was when the mountain region of Colorado was the home of numerous wild animals, but to-day these are to be found only in the more inaccessible spots. Bears, wolves, mountain sheep and goats and wildcats still range there, and in the streams the beavers fashion their dams. These mountain streams swarm with trout and are favorite resorts of fishermen.

The Rivers. The water area of Colorado is about 300 square miles; there are no lakes of any considerable size and practically all of this area is in rivers. Among all the states in the Union, Colorado stands first in the number of rivers which rise within its borders. The Arkansas, the North and South Platte, the Rio Grande, the Grand, Gunnison and Green, and other minor streams have their sources in the mountain parks; some flow to the east and others to the west. With the scenic wonders of this state the rivers have almost as much to do as the mountains; for they do not flow sluggishly over level plains, but leap down the mountain valleys, and in their age-long travels have carved remarkable gorges. Among these are the canyons of the Grand and the Gunnison and the Royal Gorge, 3,000 feet deep, through which the Arkansas finds its way from its source 10,000 feet above sea level to the plain country to the east. In the more level parts of the state rivers of the other type are to be seen. Thus the South Platte, which has its source 11,000 feet above the sea, is in Northeastern Colorado a broad, slow-moving stream, fringed with the cottonwoods so characteristic of that region. All the Colorado rivers are useless for navigation; the mountain streams are too precipitous in their courses, and those of the plains are practically drained for irrigation purposes (see *Agriculture,* below).

Scenic Wonders. Though enough has been said to indicate that Colorado has marvelous scenic advantages, the fact will bear emphasis. To the traveler who enters the state from the east, the beauty is not at once evident. All about him are treeless plains, covered with the dusty, bedraggled sagebrush—mile after mile; but presently to the west the mountains,

so hazy and distant at first as to look almost like cloud heaps, come into view, and from that time there is an ever-changing panorama. Snow-crowned peaks are everywhere to be seen, standing out clear above the purple-blue ridges, and at every turn there are new aspects and new beauties. So wonderfully clear is the air that distances seem far less than they really are, and more than one ambitious tourist has set out to walk to a mountain which he judged to be about five miles away, only to find, at the close of a whole day's jaunt, that he was not appreciably nearer.

Farther on, when the observer has actually entered the mountain country, the fascination is still greater. Up and up the roads lead, in zigzag fashion; a train needs at times four engines to pull it up the steep slopes. The way lies through gorges down which a white-foaming river rushes, and over lofty passes which open up marvelous views of range beyond range, until the eye almost wearies of so much grandeur and sublimity. Much has been done to make the natural beauties accessible. Stage routes lead to the mountain parks, and short railway trips out of the cities make possible visits to Cripple Creek, to Pike's Peak or to the top of the Great Divide, where it is the delight of tourists to have their pictures taken and labeled, "Snowballing in August."

Climate. Colorado is one of the great "health" states; people flock to it from afar to find relief from lung diseases. The mountain parks, especially, are vast sanitariums for sufferers from tuberculosis and asthma. In different parts of the state the average annual temperature varies considerably, being lower in the high mountain regions, but everywhere one condition prevails which makes for healthfulness—lack of humidity. Even in the lower sections where the heat of summer is sometimes intense, prostrations from heat are unknown. The nights are always cool, and there is a difference between the temperature in shade and in sun which is incredible to one used to the more humid atmosphere of the Eastern states. Height and dryness are the factors which account for the coolness of the shade and for the rapid fall in temperature as night comes on, for rarefied air without moisture does not hold heat as does a moister, denser atmosphere.

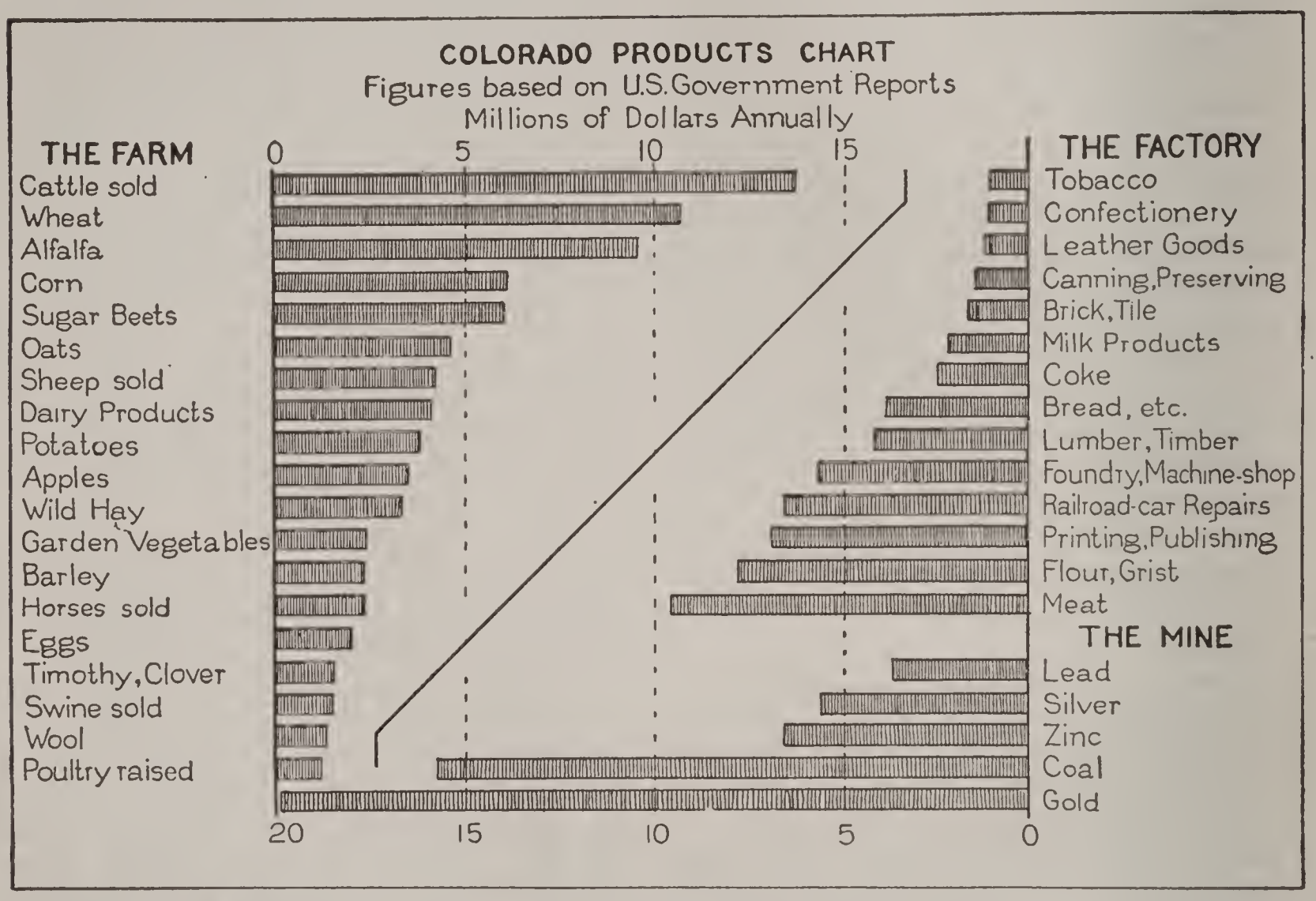
In rainfall Colorado is deficient, averaging throughout the state less than twenty inches annually; some localities have less than ten inches. Especially in the mountain region of the state, the snowfall is very heavy, and it is the melting of the accumulated snows through the spring and summer which keeps the mountain torrents always brimming.

Mineral Resources. The development of its mineral resources is one of Colorado's chief industries, and was for a time almost its only industry. Even now, after over fifty years of mining activity, it is impossible to estimate the wealth of minerals hidden in its mountains. However, it is not first among the states in its mineral production, for ten others rank ahead of it; nor is it at the head of the list in the output of any one important mineral. Its gold production, which at the beginning of the century was twice as great as that of any other state in the Union, has been slightly exceeded since 1911 by that of California, and averages only about $20,000,000 a year, as against the $30,000,000 of an earlier date. The Cripple Creek district is the center of the gold-mining industry, and few visitors leave Colorado Springs without taking the trip into the mountains where amid unrivaled scenery lies this town which sends out about three-fifths of the gold of the state.

Second in importance is coal production, in which Colorado has for many years surpassed any other state west of the Mississippi River. Most of the 8,000,000 tons mined each year is bituminous of various grades, but there is some anthracite. Zinc, silver, lead, copper, in that order, are next in rank, while rarer metals, as tungsten, uranium and manganese, are found in paying quantities. In the last few years special attention has been attracted to the Paradox Valley of Colorado and Utah because of the discovery there of the valuable radium-bearing mineral, carnotite. It is estimated that the supply here is so great as to constitute practically a monopoly of the world's radium supply. Heretofore most of the carnotite has been shipped to Europe, for the process of reduction is a tedious and expensive one which has never been practiced in the United States, but a mill for the concentration of the ores and the extraction of radium has been built in Denver, and it is expected that Colorado will soon be able to take care of much of its own supply of this wonderful element.

Manufactures. A state with such remarkable mineral resources, and especially with such inexhaustible coal beds, is certain to have extensive manufactures, and Colorado is one of the chief manufacturing states west of the

Mississippi. Many of the manufactures grow directly out of mining, smelting ore and refining metals being industries of huge proportions. There are also iron and steel works and factories for brick, cement and for the making of machinery and tools. The beet sugar industry, mentioned below; the slaughtering and packing of meat, and the manufacture of flour and grist are the other industries of considerable importance. All in all, the manufactured products were valued at about $275,000,000 in 1920, and there are over 35,000 wage-earners in the various establishments. Denver is the largest manufacturing center, Pueblo, Colorado Springs and Trinidad ranking next, in that order.



Agriculture. Another industry has had a rapid growth, and that is agriculture. Naturally, in a state so mountainous there is much land that is not available for crops, but the lack of rainfall has been an even greater drawback than the mountains. In many places there is a grassy growth sufficient for grazing, but in very few sections would it be possible to practice agriculture without irrigation. This has grown amazingly in recent years, and everywhere throughout the state are to be seen the great fields with their growing crops and the little irrigation ditches between the rows. The mountain streams are utilized, and the naturally-fertile soil is rendered very productive. Over 13,000,000 acres are now in farms, though only about one-third of this area is actually cultivated.

Sugar beets, wheat and alfalfa are the chief crops, but corn, oats and potatoes are raised in large quantities. At the census of 1910 Weld County was the second county in the United States in amount of potatoes produced, its crop of nearly 6,000,000 bushels surpassed only by Aroostook County, Me. The sugar-beet industry has grown rapidly, and the state has vast refineries in which hundreds of thousands of tons of beet sugar are made each year—more than in any other state. Colorado potatoes, especially those grown in the region around Greeley, are famous for their large size and excellent quality. The mountain valleys seem remarkably well adapted to the growing of fruits, and apples, peaches, plums, pears and cherries are produced. Most widely famous of all the products of these regions, however, are the Rocky Ford cantaloupes, of which hundreds of carloads are shipped each year.

It might be expected that the large increase in mixed farming would lead to a decrease in stock-raising, the oldest agricultural industry in the state, but such has not been the case. The cattle ranges are not to-day so large as

formerly, but the stock is better bred and better cared for. Much land that is still too dry for growing crops affords excellent grazing, and cattle and sheep seem to find the dried grass of the plains quite to their liking in the winter, even when the light snow has sifted over it. In the southern part of the state there are hundreds of thousands of sheep.

Commerce and Transportation. Since the manufactures of Colorado are so specialized, its commerce is necessarily considerable, for it produces much more of certain things than it can use, while of general merchandise of all sorts it manufactures but little. From Denver as a center, vast quantities of metals, live stock, sugar, hay and fruit are sent in all directions.

All transportation in Colorado must be by rail, since the rivers are not navigable, and Colorado is better supplied with railroads than is any other mountain state. To say that Colorado has almost 6,000 miles of railway tells but inadequately the transportation story, for the building of much of it has been a matter to try men's souls. It has not been a mere question of marking out a roadway and laying the ties and the rails, for through all the mountain section there was scarcely to be found a rod of level ground on which to build. The rocks had to be blasted out and leveled down; the chasms spanned by bridges that look frail but will not tremble as the heaviest express trains thunder over them; the persistent upgrade conquered by means of sharp zigzags that climb little by little to the pass, in some places 11,000 feet in altitude, from which is begun the equally perilous descent on the other side. On the way to Cripple Creek, for instance, the town comes into view, lying in its mountain hollow, almost an hour before the train draws in to its station, and all that time is spent in making the descent by a series of "loops" made necessary by the steep grades. What it has cost, not only in money, but in energy, in courage and even in life, to build the various roads over the mountains cannot be apparent to any but a trained engineer.

The chief roads of the state are the Atchison, Topeka & Santa Fe; the Chicago, Burlington & Quincy; the Colorado & Southern; the Union Pacific, and the Denver & Rio Grande. The last-named has the greatest mileage of any road within the state, partially because it makes the highest mountain climb. Part of its way lies through the Royal Gorge. Besides these standard-gauge roads there are narrow-gauge railways at various places in the mountains where the regular type could not prove profitable. In addition to the steam roads there are electric lines in and about the larger towns, and no well-settled portion of the state lacks good transportation facilities.

Educational and Other Institutions. Colorado has always encouraged education, and as a result stands to-day educationally among the foremost states. There are included in the state system the normal schools at Greeley and Gunnison, the University of Colorado at Boulder, the Agricultural College at Fort Collins, the State School of Mines and the Industrial School for Boys at Golden, and the Home and Training School for Mental Defectives at Denver. There are also other institutions of high rank, notably Colorado College at Colorado Springs and the University of Denver. The percentage of illiteracy is small, only 3.7 persons out of every hundred over ten years of age being unable to read and write; the showing would be far better than this were it not for the foreign-born element.

Of charitable and corrective institutions the state has the usual variety. Besides county and city institutions, there are under state control an insane asylum at Pueblo, a soldiers' and sailors' home at Monte Vista, a school for deaf and blind at Colorado Springs, a workshop for the blind in Denver, a state prison at Cañon City and a reformatory at Buena Vista. Colorado has tried certain experiments in its corrective institutions, some of which have worked out very well. The Colorado idea as put into practice in the state penitentiary is becoming the model for many other states. The prisoners in the penitentiary are paid for the work which they do for the state, whether it be road-making or the manufacture of articles used in state institutions, and half of what each man earns goes to his wife and children, while the remainder becomes his at his discharge. In sentencing to the penitentiary the indeterminate sentence has been adopted, so a man need not be released until it is felt that there is a likelihood of his becoming a good citizen. At the industrial school at Golden, to which juvenile offenders are sent, the honor system prevails, and no boy is held in confinement or uniformed in any way to look like a prisoner. The innovation which has attracted most attention, however is the juvenile court. This was not the first such court established in the country, but it has become by far

the most famous, largely because of its presiding judge (see JUVENILE COURT; LINDSEY, BENJAMIN BARR).

Government. The constitution under which Colorado is governed dates from 1876, the year of its admission to statehood. Of the amendments added since that time the most important is the one passed in 1893 by which women are permitted to vote on equal terms with men. They are also allowed to hold any office, and are frequently elected to the legislature. In 1912 another important amendment was added, providing for the recall of all elective officers (see RECALL). An amendment in effect January 1, 1916, prohibits the shipment of liquor either into the state or within the state, thus insuring statewide prohibition.

The executive department of the state consists of the governor, lieutenant-governor, secretary, auditor, treasurer, attorney-general and superintendent of public instruction, each elected for two years. Any of these except the treasurer and the auditor may succeed himself. The legislature consists of the usual two houses; it meets every other year. There are thirty-five senators, holding office for four years, and sixty-five representatives, holding office for two years. By the constitution the combined membership of the two houses may never exceed one hundred. The judiciary of the state includes a supreme court of three members, elected for nine years; district courts, county courts and justice courts.

The most interesting feature of the local government is the right which cities and towns have to establish the commission form of government; in 1913 five towns, including Denver, Pueblo and Colorado Springs, the three largest cities in the state, were under this form. See COMMISSION FORM OF GOVERNMENT.

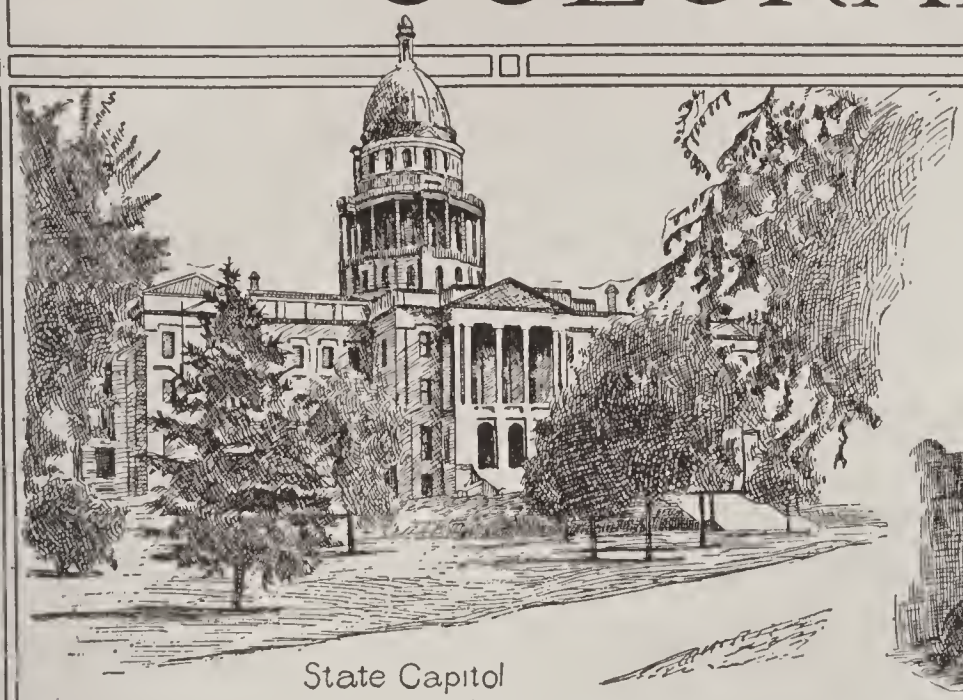
History. The name *Colorado* means literally *colored red;* it was borne first by the Colorado River and later bestowed on the territory in which one branch of that turbulent river rises. Long ago, before ever a white man entered the state, the Cliff Dwellers or Pueblo Indians lived in the southwestern part, and the second largest city has taken its name from them. Some of the Spanish adventurers visited the territory in the sixteenth century, but not finding the abundant wealth of which they were in search they made no settlements. In 1776 a Spanish expedition headed by Escalante explored the southwestern corner and traced certain river courses, but again no attempt at settlement was made.

The Louisiana Purchase in 1803 brought part of the territory into the possession of the United States, and three years later Captain Zebulon Pike, for whom the state's famous peak was named, made notable explorations. In 1820 Long, and in 1842 and 1844 Fremont, visited the region and carried back information concerning it, but it was still a practically unknown wilderness, inhabited by Indians and a very few traders, who were attracted by the wealth of furs. Partially from Texas and partially from Mexico the remainder of the territory became United States ground in 1848, and ten years later an occasional emigrant from the neighboring states to the east moved in.

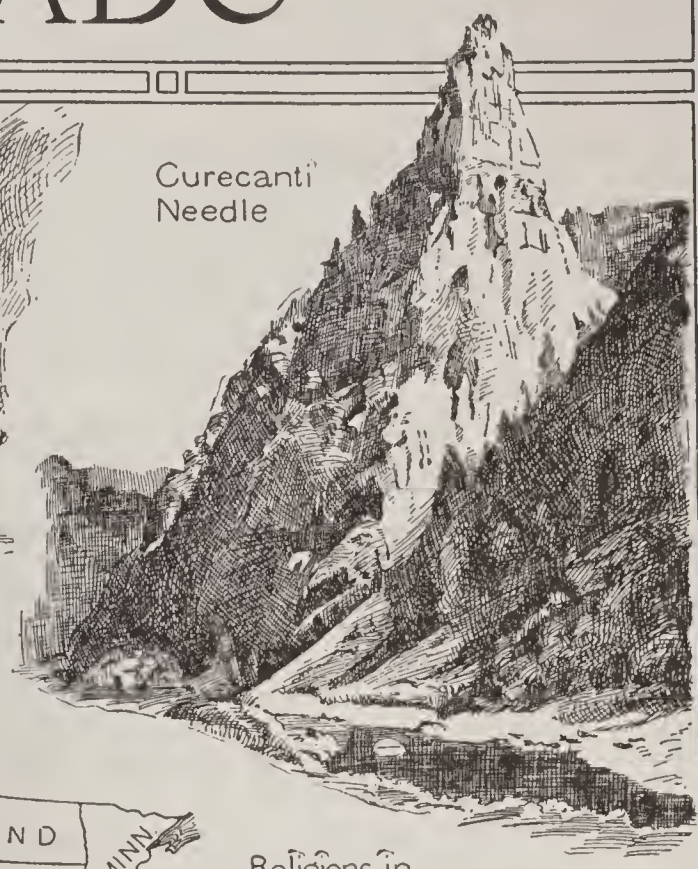
Beginnings of Growth. In 1859 gold was discovered at the present site of Boulder, and the rush of immigration began. It was not so spectacular as was the movement of a decade earlier toward California, but it reproduced many of the same conditions. Rough mining towns sprang up, out of which grew the cities of Denver and Boulder, and there was an immediate movement toward organization which took no notice of the fact that the territory was supposed to belong to Kansas. In 1861 the Territory of Colorado was organized, with an area somewhat greater than that of the present state, and agitation for admission to statehood began. The early settlers had considerable trouble with the Indians, and many a fray took place with the Cheyenne and the Arapahoe between 1864 and 1870.

Years of Statehood. In 1864 and again in 1868 vain efforts were made toward state organization, but in 1875 the Federal Congress finally passed an enabling act. It was the intention that admission to the Union should take place on July 4, 1876, but the preliminaries were delayed somewhat and the final proclamation was not made until August 1 of that year. A period of depression began soon after that date, as it became evident that the supply of gold was not inexhaustible. One mining town after another was deserted, and there are still to be found in the mountain regions these "ghost towns" which were once the scene of hopes and fears, feverish exultation and despair. But other resources were at hand, as soon as men could free their minds from the idea that gold alone was worth striving for. Silver and lead were soon found in large quantities, the possibilities of the vast grassy plains as grazing lands became evident, and the fertility of the soil called for irrigation. So the real industrial development of

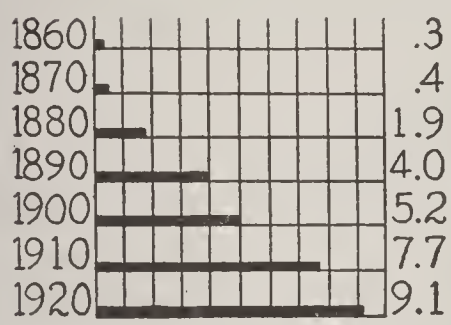
COLORADO



State Capitol



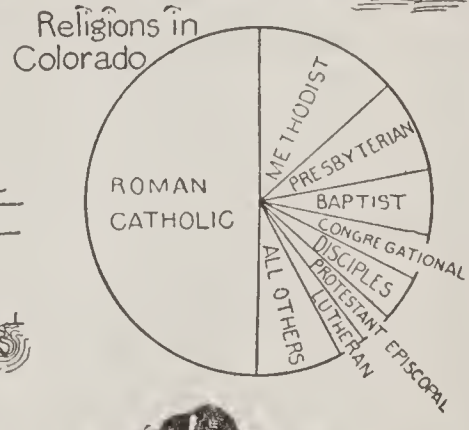
Curecanti Needle



1860 .3
1870 .4
1880 1.9
1890 4.0
1900 5.2
1910 7.7
1920 9.1

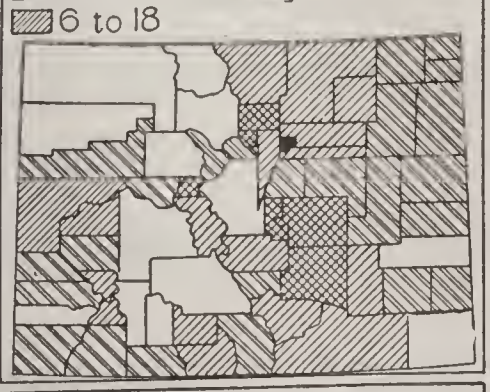
People per square mile, by decades

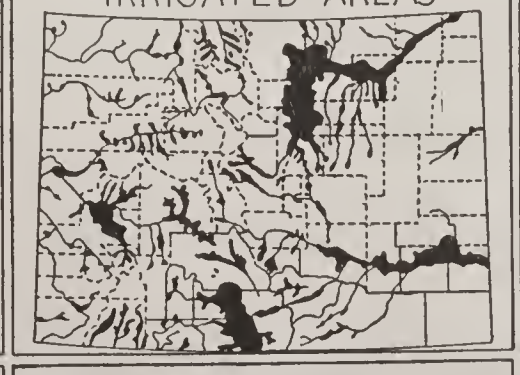
Location among the states

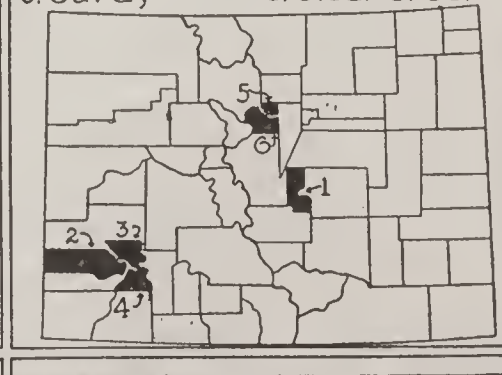


Cliff dwelling, beneath overhanging ledge

Mount of the Holy Cross







RESEARCH QUESTIONS ON COLORADO

(An Outline suitable for Colorado will be found with the article "State.")

What does the word *mesa* mean, and why is it appropriate?

How did Colorado rank at the close of the nineteenth century as regards the production of gold, and what change has taken place since then?

How does the state rank among the mountain states with reference to railroad mileage?

Why has the extension of railroads been more of an achievement in Colorado than in Illinois or Iowa?

What does the name of this state mean?

What primitive inhabitants of the state are commemorated in the name of the second largest city?

What are the mountain "parks"? Have they any importance except as summer resorts?

Why, in this state of very light rainfall, are the mountain streams never dry, even in the summer?

What four things make up the bulk of Colorado's exports?

Is the most famous mountain peak of the state also the highest?

Why is it that even during the summer months, when the days are very hot, the nights are almost invariably cool?

How has the spread of irrigation and the consequent increase in mixed farming affected the live-stock industry?

What has been, in recent years, the most interesting feature of the judicial side of the state government?

What states have an average elevation greater than that of Colorado?

Why is the sightseer often mistaken in judging distances in Colorado?

What famous product of this state finds its way to the breakfast tables of people throughout the country?

Name three important amendments to the state constitution, and tell when they were passed.

Why is the Mount of the Holy Cross so named?

What part do the rivers play in making this state one of the most famous scenic regions in the world?

What part have these rapid mountain torrents, which are of no use for navigation, had in the industrial development of the state?

What advanced ideas has Colorado worked out in connection with its penal system?

How does Colorado rank among the states as regards density of population? Has it more or fewer inhabitants to the square mile than Canada? Than Alberta?

What inducements has the mountain region to offer to sportsmen?

Name two manufacturing industries that have grown out of mining, and two that have grown out of some phase of agriculture.

Why is Colorado not so completely the "Centennial State" as it had hoped to be?

How does Colorado rank among Western states with reference to coal production?

Of what valuable mineral has it so large a supply that it is almost justified in claiming a world-monopoly?

the state began, and has gone on steadily ever since.

Labor Troubles. These have constituted one of the serious questions which Colorado has had to face. In 1894, 1896 and 1904 strikes occurred among the metal miners, that of 1904 being particularly critical and resulting in considerable loss of life. Late in 1913 another strike began, this time among the coal-miners, which had very serious consequences. Recognition of their union, a ten-per-cent advance in wages, and an eight-hour day for all mine-workers were the demands made by the miners, with special emphasis on the first. The struggle became very bitter. Actual battles took place between the strikers, who had set up their camps close to the mines in order that they might intercept strike breakers, and the hired guards stationed by the operators; a number of men, as well as women and children, lost their lives. At length, when it became evident that the local authorities could not control the disorder, President Wilson sent Federal troops to the state on April 28, 1914. Gradually order was reëstablished, and in December, 1914, the strike came to an end and the miners went back to work without having gained their point. It was not until the beginning of 1915, however, that the Federal troops were withdrawn.

Other Items of Interest. The blue spruce, which grows everywhere in the Colorado Rockies, has been chosen as the state tree.

Government statistics indicated that in 1916 Colorado placed on the market one-third of the national output of beet sugar, the total product of the state being valued at $50,000,000.

In 1858 a group of miners built for themselves near the foot of the Rockies some rude cabins of cottonwood logs. This was the beginning of Denver.

The first year of prohibition in Colorado showed a marked increase in the prosperity of the state. Fewer mortgages were foreclosed and larger bank deposits were made than ever before in a like period.

One of the most beautiful of the mountain "parks" of Colorado is Estes Park, a favorite resort site which is rendered picturesque by the Big Thompson Creek.

At Morrison, a village not far from Denver, was excavated the skeleton of a prehistoric reptile, or dinosaur, eighty feet in length.

At Cripple Creek, over nine thousand feet above sea level, the temperature falls to the freezing point nearly every night in July.

Such names as Arapahoe, Cheyenne, Manitou, Kiowa, Ouray, Saguache and Yampa are reminiscent of the time, little more than a generation ago, when Indians in great number roamed the prairies and the mountain country of Colorado.

One of the most famous peaks in the state is the Mount of the Holy Cross. High on its side two deep gullies cut each other at right angles, and as these are always filled with snow they make a very distinct and well-proportioned white cross.

There are within the state at least fifteen mountain passes in common use which are over 10,000 feet above sea level. M.C.C.B.

Consult annual reports of the United States Geological Survey, published by the Federal government.

Related Subjects. The following articles in these volumes will make clearer certain phases of the geography and the industrial life of Colorado:

CITIES AND TOWNS

Boulder	Fort Collins
Colorado Springs	Greeley
Cripple Creek	Pueblo
Denver	Trinidad

EDUCATION

Colorado, University of	Denver, University of

LEADING PRODUCTS

Alfalfa	Radium
Beet	Sheep
Cattle	Silver
Coal	Sugar
Gold	Tungsten
Lead	Uranium
Muskmelon	Wheat
Potato	Zinc

MOUNTAINS

Pike's Peak	Rocky Mountains

RIVERS

Arkansas	Rio Grande
Platte	

SCENIC FEATURES

Garden of the Gods	Royal Gorge
Parks, National	

UNCLASSIFIED

Columbine	Pike, Zebulon
Mesa	

COLORADO, *kol o rah' do,* UNIVERSITY OF, a coeducational state university, located at Boulder. It was incorporated by the legislature of Colorado Territory in 1861, and in 1877, the year after Colorado became a state, was formally opened on its present basis. The university now comprises the colleges of liberal arts, engineering and pharmacy, the graduate school, the schools of medicine and law, the colleges of commerce and education, the school of social and home service, the summer session

and the university extension division. Because of the beautiful situation of the university and the delightful summer climate of the state, the summer session is attractive to teachers. The faculty numbers about 225, and there are over 3,200 students enrolled. The library contains nearly 80,000 volumes. To Colorado come students from all over the country—young men and women attracted by the healthful and scenic situation. Thus it has come that the spirit of the university is distinguished for the breadth and character of its faculty and student community. In this young and vigorous institution early were planted the standards and ideals of the greatest of the older American universities. F.E.H.

COLORADO BEETLE. See POTATO BUG.

COLORADO RIVER, or **RIO COLORADO,** *ree'o kol o rah'do,* a famous river of the Southwestern United States, which flows through a region remarkable not only for its magnificent scenery, but also because it affords a striking

THE COLORADO RIVER

illustration of the mighty force of wind and water in changing the contour of the land. This stream, full of waterfalls and chasms, cuts through Northern Arizona on its way to the sea through one of the most wonderful gorges in the world (see GRAND CANYON OF THE COLORADO). Working its way, century after century, through hard layers of rock, slowly deepening its channel by the grinding action of its pebbles, and aided by the gradual elevation of the whole plateau, this great architect of nature has cut a mighty gash in the bosom of the earth, from the edge of which it gleams like a winding, silver ribbon.

The Colorado is formed by the junction of the Green and Grand rivers, in Southeastern Utah. From this point it flows southwesterly through Utah and into Arizona, then, abruptly turning to the left, swings westward through the Grand Canyon. A second abrupt turn, below its union with the Virgin River of Nevada, gives it a southward course, and it then flows as the boundary between Arizona on the one side and Nevada and California on the other, until it reaches the Mexican border. Passing through 450 miles of Mexican territory, it reaches the Gulf of California about 2,000 miles from the headwaters of the Green, and about 1,100 miles from the union of the Green and the Grand.

The area drained by the Colorado and its tributaries is about 225,000 square miles. It is a river of great variations in descent, width and depth. In some rocky places it is scarcely more than seventy-five feet wide, but in the open stretches and in the valley region of its lower course it broadens out to a distance of 1,300 feet or more. In May and June floods cause the river to overflow its banks, and in the fertile valley near Yuma, Ariz., which is often inundated, it is sometimes called the "Nile of America." Light steamers can navigate the Colorado for a distance of 500 miles from its mouth, but the many channel obstructions and the seasons of low water make the stream as a whole of little value for navigation.

COLORADO RIVER, one of the most important rivers of Texas, which, with its tributaries, drains an area as large as the state of Tennessee. Rising in the west-central part of the state, at the foot of the Great Plains, it flows southeasterly to the Gulf of Mexico and empties into Matagorda Bay, 900 miles from its source. The beautiful scenery of its valley and the deep canyons along its course make it one of the most picturesque streams of the state. Austin, the capital of Texas, is situated on the Colorado about 200 miles from its mouth. The river is not considered a navigable stream, except for a few flat-bottomed boats. The river is an important source of water power, is used in irrigating the rice districts along its southern course, and carries a great deal of the local commerce of the section through which it flows.

COLORADO SPRINGS, COLO., the county seat of El Paso County, is one of the favorite tourist and health resorts of the United States and an important center for the reduction and refining of ores. The altitude of the city is 6,036 feet. Above it towers Pike's Peak, 14,-

019 feet above sea level. It is in the central-eastern part of Colorado, about seventy-five miles south of Denver, and on the Denver & Rio Grande; the Atchison, Topeka & Santa Fe; the Colorado & Southern; the Colorado Midland; the Chicago, Rock Island & Pacific, and the Colorado Springs and Cripple Creek railroads. The summit of Pike's Peak is reached by a cog road and by an automobile highway, the highest in the world. Colorado Springs is the crossing point of the Pike's Peak Ocean-to-Ocean and Colorado-to-Gulf automobile highways. The city covers an area of more than nine square miles. The population, which in 1910 was 29,078, was 29,572 in 1920.

The plains sweep up to the very foothills of the Rocky Mountains, and at their base is the city of Colorado Springs; to the west and northwest are two other incorporated towns continuous with it—Colorado City and Manitou. The first of these contains the world's largest cyanide reduction mills, and Manitou is a famous health resort, built up about medicinal springs.

Parks and Boulevards. Colorado Springs has a municipal park system containing nearly 2,700 acres and valued at $1,883,765. The largest parks are Monument Valley Park, extending for two miles along railroad tracks entering the city from the north; the famous Garden of the Gods (which see), a natural park of 480 acres about two miles northwest of the city; and Palmer Park, containing over 700 acres, to the northeast. Stratton Park at the entrance of North and South Cheyenne canyons, six miles southwest, is owned by the Stratton estate, but is open free to the public. These and many other places of interest are connected by excellent hard-surfaced roads and boulevards.

Buildings and Institutions. Among many noteworthy public buildings are the Federal building, erected in 1909 at a cost of $225,000, El Paso County courthouse, Burn's Theater, a Y. W. C. A., and a Carnegie Library. Glockner Sanatorium, Saint Francis and Bethel hospitals, Cragmore and Sunnyrest sanatoriums, the Star-Ranch-in-the-Pines and a number of other places receive sick persons who come to Colorado Springs from every part of the United States. The Union Printers' Home, a national institution and the only one of its kind, is located just east of the city. Ten miles north is the National Sanatorium of the Modern Woodmen of America. South of the city along the boulevard to Cañon City and the Royal Gorge is the Myron Stratton Home, an institution for dependent children and aged men and women.

Colorado College, a non-sectarian, coeducational institution, was founded at Colorado Springs in 1874 by General William J. Palmer. The city is also the seat of the Colorado School for Deaf and Blind and of four private schools for boys and girls.

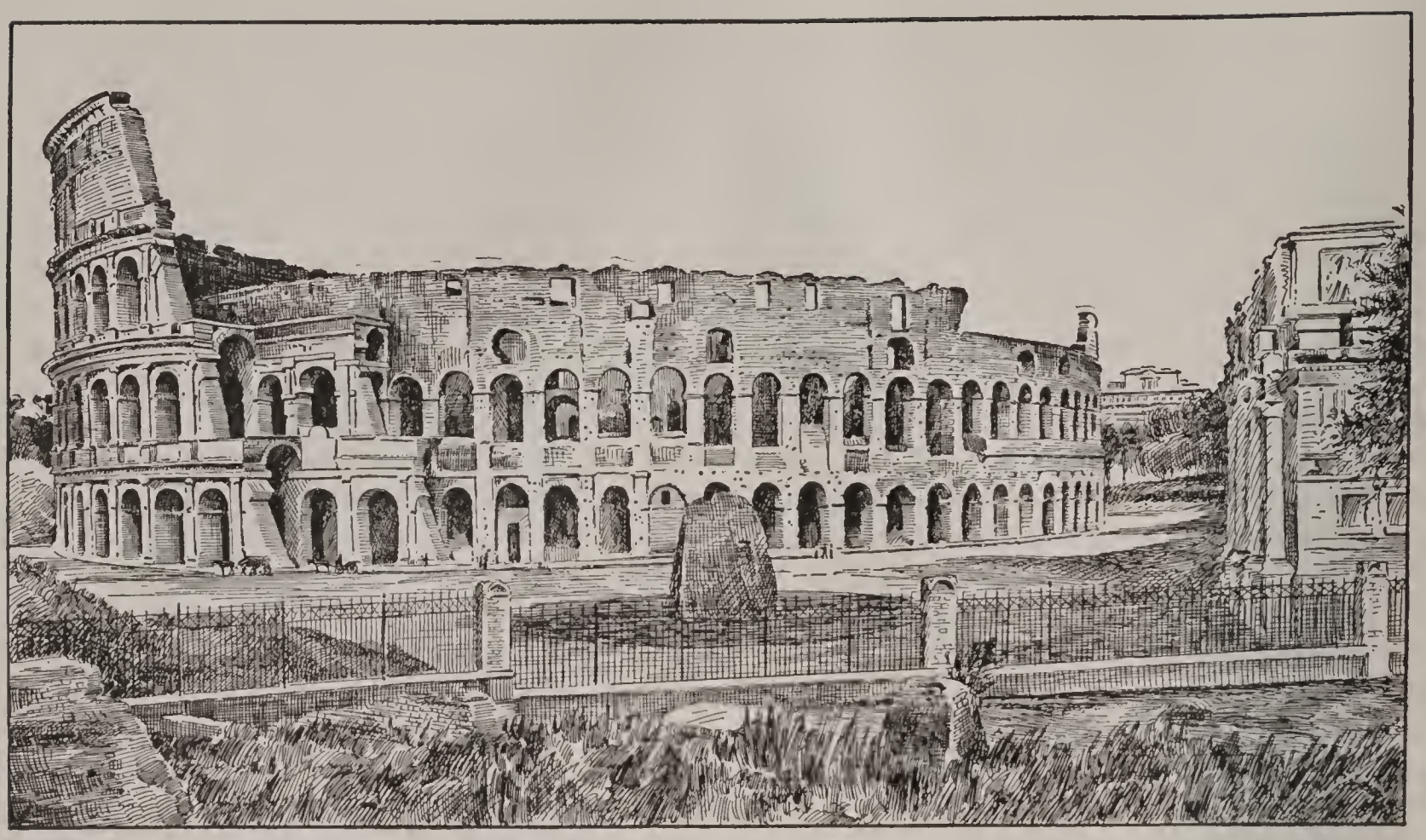
History. Colorado Springs was founded by General Palmer in 1871 and incorporated as a town in 1872. A city charter was granted in 1878. The prosperity of the city is due to the many natural advantages of location combined with the great wealth of the Cripple Creek mining district, about fifty miles distant. The three-million-dollar water system, which brings water from streams and reservoirs on Pike's Peak, is owned by the municipality. In 1909 the city adopted the commission form of government. A.W.H.

COLOR BLINDNESS. When a man applies for employment on a railroad, he is required to take an examination in colors, in addition to his other examinations. A heap of woolen skeins is given him, and he is asked to sort them, placing similar colors together. If he fails in his recognition of any of them he cannot be employed, for the safety of the public depends on the trainman's being able to recognize with certainty the red danger signal, or the green safety signal.

To people with normal vision it seems strange that anyone should not be able to distinguish colors, but there are persons who are color blind, that is, unable to recognize certain colors. The defect may be inborn, or it may be the result of a long, strained attention to colors; in either case it is incurable; no sort of glasses ever has been invented to remedy it. A few people are so unfortunate as to recognize no colors except black and white, but the large majority of color-blind persons are blind to only one or two colors. Green blindness and red blindness are the commonest of all forms, one or both of these brilliant colors appearing as some shade of yellow.

COLOR PRINTING. See PRINTING, subhead *Color Printing*.

COLOSSEUM, *kol o se' um,* or **COLISEUM,** a name applied to many modern places of amusement, but originally meaning the ancient Flavian Amphitheater in Rome, now one of the most famous ruins in the world. The name was derived from the colossal statue of Nero, which stood near the amphitheater. That mammoth, unroofed building, a place of marble,



THE COLOSSEUM AT ROME, AS IT APPEARS TO-DAY

ivory, gems, silks and perfumed fountains, was for years the scene of combats between gladiators, fights of wild beasts and persecution of Christians. It was begun by Vespasian and finished by Titus, A. D. 80.

It was built in the form of an oval, about 620 feet long, 510 feet wide and 160 feet high, and is said to have seated 87,000 people. The flooring of the *arena,* or central space, was of boards covered with red sand, to soak up and conceal blood. A low wall enclosed the arena, and underneath were rooms for housing men and animals. Surrounding the arena were four tiers of marble seats for the spectators. Three rows of columns decorated the exterior of the building, Doric on the first story, Ionic on the next, and Corinthian on the third (see COLUMN). This imposing building remained almost uninjured down to the sixth century. Then, in the time of Theodoric and up to the eighteenth century, many pieces of marble were removed and used for other structures. In the eighteenth century through the efforts of Pope Benedict XIV it was saved from complete destruction, and although the ruins today show four stories on one side only, Byron's prophecy in *Childe Harold's Pilgrimage* may still hold true:

"While stands the Coliseum, Rome shall stand;
When falls the Coliseum, Rome shall fall;
And when Rome falls—the world."

COLOSSUS, *kō los′us,* anything of gigantic size, but a name used especially in sculpture for a statue much larger than life-size. The bronze statue of *Liberty Enlightening the World* in New York harbor is the largest ever made. It is three times as high as the ancient *Colossus of Rhodes,* one of the seven wonders of the ancient world. The latter was a bronze figure representing Helios, the sun god, and is said to have stood astride the entrance of the harbor of Rhodes until destroyed by an earthquake and sold to a Hebrew for old metal.

Other modern colossi which are viewed with interest by tourists are the *Germania,* at Niederwald on the Rhine, *Bavaria* at Munich, and the statue of *Peter the Great* at Petrograd.

The Egyptians furnished the earliest examples of colossal statuary. Among those are the wonderful colossi at Abu-Simbel of the great king, Rameses II. Another one of interest, now preserved in the British Museum, is the human-faced Assyrian Winged Lion. But the most celebrated are those of Amenophis III, the head of one of which is displayed at the British Museum. That is the Memnon whose vocal powers were the fabled wonders of ancient times. It is now believed that the human tones which issued from this statue were due to the cracking of the stones when the morning sun warmed the dew-covered colossus. See MEMNON.

The most artistic colossi were produced by the Greeks, such as the bronze statue of Pallas Athene on the Acropolis of Athens, the gold

and ivory Athene in the Parthenon at Athens and the Olympian Zeus. Following the Greeks, the Romans produced such gigantic statues as that of Jupiter on the Capitol and the 110-foot Nero, which suggested the name "Colosseum" for the near-by amphitheater.

For illustrations of colossi see ASSYRIA; LIBERTY, STATUE OF. See, also, SEVEN WONDERS OF THE WORLD.

COLTS'FOOT, a useful wild plant, native of Europe, but now found throughout the Northern and Middle United States and in Canada. It grows from downy seeds in the stiffest clay or in low, moist places. The light yellow, dandelionlike flowers appear on leafless stems in March or April, and are much sought by the bees. Toward noon, in the hot sunshine, the flowers close. The leaves do not appear until the flowers have died. The leaves are large and broad, five to eight inches long and three to six inches wide. They are attractively downy beneath; at first they are rounded, but later become heart-shaped, or like the foot of a colt. These leaves have been made into cigars to be smoked in cases of asthma, and are still used for diseases of the lungs.

False coltsfoot is the wild ginger of the birthwort family, and the *beetleweed* of Southern mountains is often called coltsfoot.

COLUMBIA, *ko lum' bi a,* in the Canadian Rockies, the loftiest peak in Alberta, rising 12,740 feet above sea level. It lies just east of the British Columbia boundary, in latitude 52° 7′ north, and is about 160 miles southwest of Edmonton and 100 miles northwest of Banff. Near it are the headwaters of the Athabaska and Saskatchewan rivers.

COLUMBIA, Mo., the county seat of Boone County. It is north of the center of the state, twenty-five miles north of Jefferson City, the state capital, and 145 miles northwest of Saint Louis. It is on branch lines of the Wabash and the Missouri, Kansas & Texas railroads. Here are located the University of Missouri (which see), opened in 1841; Christian College (Christian), 1851; Stephens College (Baptist), 1856; the Bible College, and the Welsh Military Academy. One of the university buildings contains the library of the State Historical Society. A monument to Thomas Jefferson, originally erected over his grave at Monticello, Va., stands now on the university campus. Other features of interest are a United States agricultural experiment station and weather bureau office and Parker Memorial hospital.

Columbia was founded in 1821. In 1910 the population was 9,662; in 1920 it was 10,681, exclusive of students. The area of the city exceeds three square miles. Among the industrial enterprises are a shoe factory, ice plant, flour and planing mills, packing plant, and manufactories of farm implements. C.O.H.

COLUMBIA, PA., an industrial center and shipping point, on the east bank of the Susquehanna River, in the southeastern part of the state. Harrisburg, the state capital, is twenty-nine miles northwest; Lancaster is twelve miles east; York is twelve miles southwest. It is on the Pennsylvania, the Philadelphia & Reading, and Philadelphia & Columbia railroads. The river at this point is nearly a mile wide, and is crossed by one of the longest bridges in the United States. The area of the city is nearly one and a half square miles. The population in 1920 was 10,836.

Surrounding Columbia is one of the richest tobacco-producing sections in the United States. Foundry and machine-shop products, boilers and engines, iron, silk, lace, skirts, stoves, wagons, brushes, novelties and flour are the chief manufactures. Shipping facilities, both by water and rail, are excellent. A large opera house, costing $125,000, three banks, a public hospital and the state armory are important buildings. A building erected between 1740 and 1750 still stands on South Second Street. It was fortified after the defeat of General Braddock and was the refuge of settlers who fled from the west bank of the Susquehanna to escape the Indians.

English Quakers from Chester County made the first settlement on the site of Columbia in 1726. For many years the place was called Wright's Ferry. Because of its beautiful location it was one of the places considered in 1789 for the location of the United States capital. It was incorporated as a borough in 1814. A.L.C.

COLUMBIA, S. C., the capital of the state and the county seat of Richland County, with a population, largely American, of 37,524 in 1920, which was an increase of 11,205 since 1910. Its situation is about the geographical center of the state, at the junction of the Broad and Saluda rivers, which form the Congaree. Up to this point the last-named river is navigable. The city is also situated on the Columbia Canal. Charleston is 129 miles southeast, and Washington, D. C., is 488 miles northeast. Railway service is provided by several branches of the Southern Railway, and by the Atlantic Coast Line, Seaboard Air Line and the Colum-

bia, Newberry and Laurens railroads. The area of the city is over four square miles.

Columbia is located in the Pine Barrens district, on a bluff which rises 100 feet above the river. It is a beautiful city, with many shaded streets 100 feet wide, and the principal streets have parkways; four avenues radiating from the capitol are 150 feet wide. Twelve acres are assigned to parks, the largest being Irwin Park, and there are spacious grounds surrounding the capitol. A number of monuments ornament the city, the most striking being the bronze Palmetto Tree. The imposing granite statehouse was erected at a cost of $4,000,000, and was modeled after the Capitol at Washington, D. C. Other state buildings of interest are the governor's mansion, the South Carolina insane asylum, the penitentiary and the Soldiers' Home. The Federal building, in course of erection in 1916, was given an appropriation of $335,000. Columbia adopted the commission form of government in 1910.

Education. For a city of its size, the educational advantages are above the ordinary. In addition to its public school system, it has Chicora College and Columbia College for women, Presbyterian Theological Seminary, Lutheran Theological Seminary, two colleges for colored pupils, Benedict College and Allen University, an Ursuline Convent and the University of South Carolina, which was founded in 1805. There are also three business colleges. The Y. M. C. A. and the Y. W. C. A. also are represented.

Industry and Commerce. The development of Columbia's manufacturing interests has been steady; the surrounding country is fertile and rich in cotton, with forests of pine, oak, walnut and maple, and vast beds of kaolin are also found in the vicinity. In 1892 there was one cotton mill in the city, and now four of the Whaley system of cotton mills are located here, besides the Olympia, which claims to be the largest in the world operating under one roof. About 4,500 people are engaged in the cotton industry. The Columbia Mills Company produces more than 20,000 bales of cotton duck annually. Besides this paramount industry, there are hosiery works, cottonseed-oil mills, fertilizer plants and extensive car-machinery and iron works. The Columbia Canal furnishes abundant water power for manufacturing, for lighting and for street railways, but the largest establishments are operated by electric power; a 25,000-horse-power hydroelectric plant was completed in 1916.

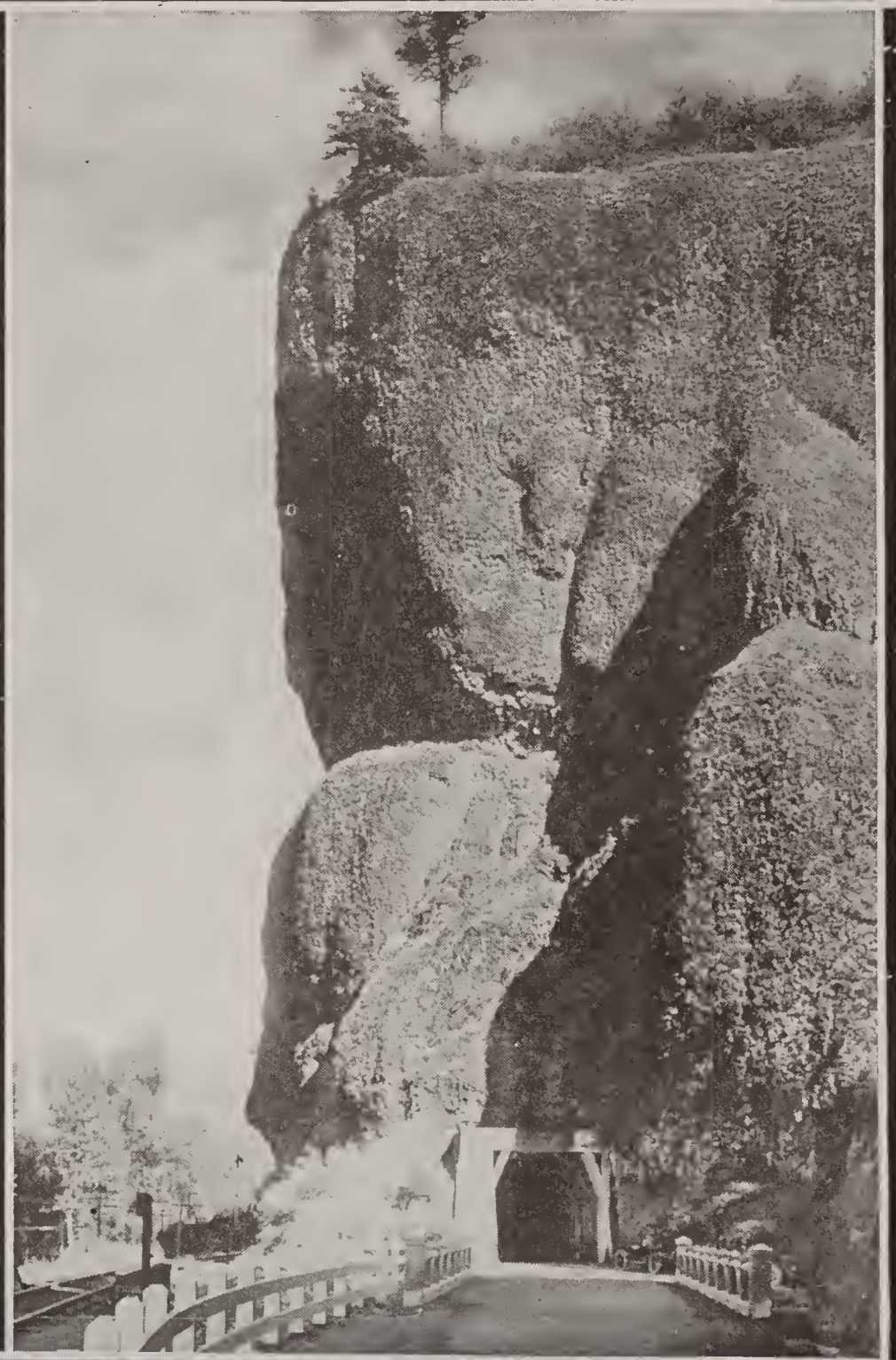
History. In 1700 the town was settled, and it was made a city in 1786. It was chosen for the capital in 1790, when the people of the state desired for the purpose a more central location than Charleston. R.W.H.

COLUMBIA RIVER, a large and important river of the Northwestern United States and Southwestern Canada, one of the greatest salmon streams of the world and equally famous because of the magnificent scenery along its course. It is from 1,300 to 1,400 miles in length, and drains an area of about 259,000 square miles, about equal to that of Texas. The Columbia River rises in the eastern chain of the Rocky Mountains of British Columbia and flows northwest for about 180 miles, through a famous hunting and trapping region, until the Great Bend is reached; then swinging about in a sharp curve it flows southward into Washington.

Just before it crosses the United States boundary it is joined by the Pend Oreille River, or Clarke's Fork. In Washington it follows a winding course, flowing south until it is joined by the Spokane River, then west, then south again, and then southwest until it reaches the Oregon boundary. Near the Oregon line, after meeting its largest tributary, the Snake River, it turns westward below the point of junction and forms the boundary between Oregon and Washington to the Pacific.

Rapids and falls break up the Columbia into several navigable stretches. One hundred sixty miles from its mouth, where the river crosses the Cascade Range, are the beautiful rapids known as the Cascades, extending for four and one-half miles through a narrow gorge. Around the rapids the United States government has built a canal, to enable ships to continue the trip of fifty-three miles beyond, to The Dalles, a series of falls and rapids twelve miles in extent. In May, 1915, there was opened for traffic a canal built around these rapids, connecting The Dalles and Celilo, where they end. From Celilo the river is navigable to Priest Rapids, a distance of 198 miles, and navigation is also possible on several shorter stretches farther up stream. The Columbia has a total navigable length of 756 miles.

The river has the only deep-water harbor between San Francisco and Cape Flattery, on the northwestern coast of Washington, and the only fresh-water harbor on the Pacific. Though the entrance to the harbor is obstructed by sand bars, a great jetty has been constructed which so increases the velocity of the current



COLUMBIA RIVER HIGHWAY.

At left, above, Shepperd's Dell, with 150-foot concrete bridge. Below, the Bowlby Tunnel, through solid rock, with openings overlooking the river. At right, Oneonta bluff and tunnel.

COLUMBIA RIVER HIGHWAY.

At left, Multnomah Falls, 925 feet high. At right, Horse Tail Falls, so close to the highway that the spray keeps the road moist.

that the bars are swept free of sand, and deep-sea vessels may pass into the harbor (see JETTY). Vancouver, Wash., is situated on its northern bank, just above its junction with the Willamette, and Astoria, Ore., is at its mouth. The river is an important route for the commerce of these cities. C.H.H.

COLUMBIA RIVER HIGHWAY. In 1856 the first rough dirt wagon road was cut through the wilderness in Oregon for six miles along the Columbia River. Nothing better illustrates the spirit of the West than the remarkable highway developed from that pioneer slashing through the woods. The Columbia River Highway is one of the world's scenic roads, 60½ miles in length. It skirts the river over mountains, winds sinuously around hills, lies along valleys, runs through tunnels and trails along embankments, and in every mile there has been an effort to preserve for the traveler the natural beauty of the region. On no part of the highway does the grade exceed five per cent—a notable engineering feat.

The Highway extends west from Portland through Astoria to Seaside, on the Pacific Ocean, and east from Portland along three routes eight miles to the Sandy River. From this point a single road skirts the south shore of the Columbia River to the Hood River County line. Numerous bridges along the route are of concrete, some of them over 300 feet long; one viaduct is 880 feet in length. Within ten miles on one part of the Highway are eleven waterfalls. At certain points the road is 700 feet above the river. The work of laying the road was begun in 1913, and the Highway was opened in 1915.

COLUMBIA UNIVERSITY, one of the oldest and most important universities in the United States, located in New York City on Morningside Heights, overlooking Riverside Drive and the Hudson River. No other American university has so large an annual enrollment. This great institution is the outgrowth of King's College, the charter of which was granted in 1754 by King George II. The first class was graduated in 1758; the work has continued without interruption since then, except for a few years during the Revolution.

When the institution was reopened in 1784, at the close of the Revolutionary War, it was called Columbia College, and in 1896 the trustees changed the name to Columbia University, Columbia College being reserved for the men's undergraduate department. In 1889 Barnard College (which see), an undergraduate school for women, was established.

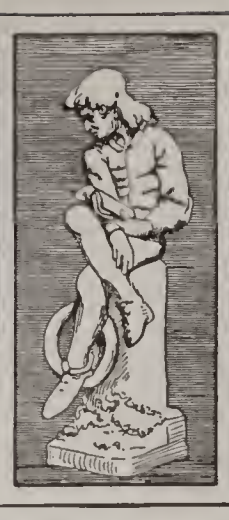
The other departments are the professional schools, comprising the school of law, the college of physicians and surgeons, the schools of mining, engineering and chemistry, Teachers' College, the faculty of fine arts, including architecture, music and design; the New York College of Pharmacy; the non-professional graduate schools of political science, philosophy and pure science, and the summer school.

Women are admitted as professional students to Teachers' College and to the College of Pharmacy, as graduate students to the schools of philosophy, pure science and political science and to the summer school and extension department.

There were in all the departments in 1920 over 1,500 instructors. The yearly number of students exceeds 25,700. The value of the university holdings is $50,000,000; the library contains about 530,000 volumes. Over a thousand students enlisted in the War of the Nations.

COLUMBINE, *kol'um bine,* a favorite garden and wild flower, and the state flower of Colorado. Although native to Europe and Asia, it is now found throughout the United States and far into Canada, and is often, in error, called *honeysuckle.* The leaves are rounded and notched. The flowers, blue, red, pink and white, have five cone-shaped petals, in the rounded points of which are stores of nectar. Bees of all kinds, butterflies, moths and even humming birds come to these dainty, drooping flowers to feast. When these "honey-cups" appear "on the rifts of the rock," we know it is the beginning of summer. Lovers of the columbine have endeavored to make it the national flower.

Bronzed and molded by wind and sun,
Maddening, gladdening, every one,
With a gypsy beauty full and fine—
A health to the glorious columbine.
—GOODALE: *Columbine.*



COLUMBUS, CHRISTOPHER (probably 1451-1506), the discoverer of America, the first man to sail west in a determined effort to reach the East. Slighted during his years of preparation and scorned as a half-insane fanatic; neglected and abused even after his wonderful discoveries, he has in the centuries since his death been shown such honor as falls to the lot of few men. In the western hemisphere, which he first brought to the knowledge of men, countries, rivers, states and cities have been named for him almost to the number of four score, and the favorite poetic name for the United States is "Columbia." All the honor shown him he richly deserved, for his were not chance voyages during which he happened upon new shores, but carefully-planned expeditions carried out by a clear-thinking man of large faith, in the face of opposition that would have daunted anyone less iron-willed.

Early Life. The name as usually printed to-day is not quite as Columbus used it, for he was an Italian, and the correct spelling of his name was CRISTOFORO COLOMBO. He was born in Genoa, but as to the exact year of his birth there has been much uncertainty, some authorities holding that it was 1446, others that it was 1451, as given above. His father was a wool-comber, but Columbus had a love of the sea from his youth up; trustworthy records declare that in 1470 he shipped as a sailor and for some years spent part of his time on the sea. Uncertain accounts of his voyages have survived—accounts of a voyage to Chios, of an attempted one to England, which was prevented by the attacks of a privateer, and, most interesting of all, of one to Iceland. Did Columbus really reach that northern island and perhaps hear from the Norsemen there of the land beyond the western seas which their ancestors had reached—a land later called America? Legend-loving people have delighted to think so, but there seems little if any foundation for the tradition.

By 1477 Columbus settled in Lisbon, for Portugal was in those days the country most favorable to navigators; and there, in 1478 or 1479, he married a lady of good family, by whom he had one son, Diego. Certain members of his wife's family were navigators, and Columbus came into possession of their charts, which further increased his interest in geography. He himself was an expert map-maker. In the works of Marco Polo he read much that inflamed his imagination—tales of the wonders and riches of Far Cathay (China), of gorgeous cities, golden-roofed palaces; of Cipango (Japan), with its golden streets and its jewels; and he became more and more determined to find a direct route to those countries.

CHRISTOPHER COLUMBUS

From the bust of the discoverer, now in the Capitoline Museum, Rome.

The Great Idea. It must be borne in mind that Columbus did not originate the theory that the earth was round. Aristotle, before the beginning of the Christian Era, had preached

that doctrine, and many educated men through all the ages since his time had believed it. The mass of the people, to be sure, still held that the earth was flat, and even those who believed differently had some very curious notions. There could be no inhabitants on the other side of the globe, they contended, because they would be walking head down and would naturally fall off; and it was not safe for a ship to sail down one side of the earth, because it could not possibly get up on the other. But none of these difficulties discouraged Columbus. If the earth was round the countries to the east could certainly be reached by sailing westward, and he was willing to risk his life to prove it. Of the great continent of America which lay in his way he knew or dreamed nothing.

He could not start out on such an expedition as he planned without very substantial aid, and this it seemed impossible to procure. Men laughed at him—men who afterward would have given their fortunes to have posed

THE CONVENT OF LA RABIDA

The reproduction of this building at the World's Columbian Exposition, Chicago, 1893, made it a familiar object to millions of people. It still stands in the same location in Jackson Park, Chicago, overlooking Lake Michigan, and is used as a sanitarium for sick babies.

as his patrons. At first he went to Genoa, his native town, and besought wealthy men there to finance his expeditions; then he turned to King John of Portugal, who had been generous to other navigators. Failure met his every effort, however, and in 1484 he went to Spain, to lay his case before Ferdinand and Isabella. His life during the following years presents a pathetic picture. With his little son Diego he journeyed from one Spanish city to another, following the court, and pleading not for himself but for his great idea. At times, utterly weary, he rested in the monasteries, but he could not remain inactive long. Finally, late in 1491, he decided to leave Spain for France, and was on his way when he stopped at the convent of La Rabida. There he made the acquaintance of Juan Perez, who had formerly been Queen Isabella's confessor, and Perez, inspired by the zeal of Columbus, wrote a letter to the queen which resulted in the recall of Columbus. Through the queen's aid—according to some accounts, through the sale of her jewels—three vessels were fitted out for him, and he was authorized to take possession of all the land he might discover, in the name of Spain.

America Discovered. On August 3, 1492, Columbus set sail from Palos with his three little sailing vessels, the *Nina,* the *Pinta* and the *Santa Maria,* the largest of which had a deck length of but 163 feet. It was perhaps the bravest exploit ever undertaken, for he was sailing not along the coast, but straight out into the "Sea of Darkness," as the Atlantic was then called, every minute farther and farther from the only land he really knew. Surely history shows few sublimer figures. His crew were not so confident as was he of the outcome of the voyage; they feared the hideous monsters with which they believed the ocean was peopled, and as they sailed week after week with no sign of land, they despaired of ever finding their way back to Europe. According to some accounts they threatened mutiny, but through it all Columbus remained firm and refused to turn back. Joaquin Miller, in his poem *Columbus,* has shown well the spirit of the man.

Behind him lay the gray Azores,
Behind the Gates of Hercules;
Before him not the ghost of shores,
Before him only shoreless seas.
The good mate said: "Now must we pray,
For lo! the very stars are gone.
Brave Admiral, speak, what shall I say?"
"Why, say, 'Sail on! sail on! and on!'"

Finally signs of land began to appear, such as broken branches of trees, and land birds; and on October 12 came the triumph:

Then, pale and worn, he kept his deck,
And peered through darkness. Ah, that night
Of all dark nights! And then a speck—
A light! A light! A light! A light!
It grew, a starlit flag unfurled!
It grew to be Time's burst of dawn.
He gained a world; he gave that world
Its grandest lesson: "On! sail on!"

Early in the morning they landed on an island which Columbus called San Salvador, now supposed to be the present Watling's Island, one of the Bahamas. This, he felt sure, was not Cipango; neither was Cuba, which he reached later, but he did believe this latter to

be a part of Asia. Haiti, on which he landed in December, he named Española ("Little Spain"), and this he decided must be the marvelous Cipango. Nor did he, to the day of his death, ever know that he had reached not Japan but a land the knowledge of which had never before come to the ears of Europeans. On the island of Haiti he left a colony of thirty-seven men and there built a fort, and in January, 1493, he began his return voyage, taking with him some gold and a few of the island Indians. Most enthusiastic was the reception given him by the king and queen and by the people, for had he not opened up to them the wealthy Indies?

THE PINTA, THE NINA, THE SANTA MARIA

These replicas, brought from Spain, were presented to the city of Chicago and given a permanent anchorage in the lagoons in Jackson Park, the site of the World's Columbian Exposition. In 1914 the Pinta was loaned to the San Francisco exposition; it was to journey through the Welland Canal, down the Saint Lawrence River to the ocean, then southward to the Panama Canal and up the coast to California. At Erie, Pa., it was found unseaworthy, and there it was left.

MAP OF THE WORLD IN COLUMBUS' BOYHOOD

The white area represents extent of explorations.

Later Voyages. For his next voyage Columbus had no difficulty in securing ships, money and men, and when he set out on September 25, 1493, he had with him seventeen ships and however; and enemies at home were having too long a time to spread evil reports about him, so in 1496 he returned to Spain, where again the sovereigns showed him great favor.

During his third voyage, on which he set out in May, 1498, he took a more southerly course, and after sighting Trinidad sailed for a few days along the coast of South America. Then he proceeded to Española, where he found a new town, Santo Domingo, in the ascendancy, and in general viewed a most troublesome state of affairs. In vain he tried to restore order; he was not as able an administrator as he was a navigator, and in August, 1500, he was superseded as governor of the island by Bobadilla, sent out from Spain through the effort of Columbus' enemies. The veteran admiral was harshly treated, placed in chains and sent back to Spain, where this cruel handling of him roused great excitement among the people. The king and queen had him freed, denied any part in his arrest, and in 1502 allowed him to set out on another voyage—his fourth and last. Contrary to instruction, he anchored off Santo Domingo but was not allowed to land, and went on to the west, sailing along the coast of Central America. Everything he attempted seemed to fail. The

colony he founded in Central America was abandoned, his vessels, worn and rotted, gave out at Jamaica, and there he with his followers remained while a messenger set out in a canoe for Santo Domingo to find help. Month after month Columbus waited, but finally the messenger returned with a vessel which he had secured, and the little band of castaways set sail for Spain.

Through much of this voyage Columbus had been ill, and affairs in Spain were not such as to encourage him. Isabella died soon after his arrival, and Ferdinand steadfastly refused to interest himself in any further explorations or in seeing that Columbus received his rightful recognition. Disappointed and worn out, Columbus died at Valladolid on May 20, 1506. He was buried in a monastery in Seville, but in 1542 his body and that of his son Diego were removed to Santo Domingo, in Haiti, and placed in the cathedral there. Two centuries and a half later, in 1796, both bodies were carried to Havana, but even there they were not allowed to rest. When Spain lost Cuba in 1898, these precious possessions, the body of the greatest navigator who ever sailed in the name of Spain, and that of his son, were borne again to Seville, and there placed in the cathedral.

THE COLUMBUS COAT-OF-ARMS

Summary. Far-seeing as he was, Columbus could have no conception of what his discoveries really meant to the world. That the course of history would be entirely changed, that prosperous, progressive nations should grow up in the new hemisphere which he had discovered, he never imagined. Other navigators, convinced that the dangers of the open sea were less than they had believed, made the same voyage, and one, Americus Vespucius, had the honor of giving his name to the great new continent. But Vespucius had been a friend of Columbus, and withheld nothing due his memory. Efforts were once made to change the name, to give honor where honor is due and call the western world Columbia, but

Outline and Questions on Columbus

I. Years of Preparation

(1) Birth and early life
(2) Love of sea
(3) Marriage

II. The Great Idea

(1) Belief of times as to shape of earth
(2) Object of Columbus
(3) Attempts to secure aid of
  (a) Genoese merchants
  (b) King of Portugal
  (c) King and queen of Spain

III. His Voyages

(1) First voyage
  (a) The journey
  (b) The discovery of the New World
(2) Later voyages
  (a) Colonies on Espanola
  (b) Visit to South America
  (c) Malicious efforts of his enemies

IV. Death and Burial

(1) Grief over lack of recognition
(2) Death
(3) Burial at Seville
(4) Subsequent removals of body

V. Estimates

(1) What he thought he had achieved
(2) What he really had achieved
(3) Honors shown him since his death
(4) Why these are deserved

Questions

How old was Columbus when he discovered America?

Why was one of the buildings at the World's Columbian Exposition known as *La Rabida?*

In what places has the body of Columbus lain? Why was it moved each time? Where is it now?

Why does Columbus deserve more honor than any mere adventurer who in the course of a voyage accidentally discovers new territory?

What were the ships of Columbus called? What kind of ships were they? Where may replicas of them be seen?

What was the idea of the people in the time of Columbus as to the shape of the earth? Was Columbus the first to hold a different view?

Why was the western hemisphere not named after Columbus?

With what event in the life of the explorer does the poem *Columbus in Chains* deal? What was the effect on the people?

For what countries was Columbus seeking when he first set out? Did he believe when his voyages were over that he had found them?

What happened in Spain whenever he was absent for any length of time?

What indications are there in his early life that he was always fond of the sea?

What was the first land in the western hemisphere that he touched upon?

What traveler had written descriptions that influenced Columbus in his ambitious desires?

COLUMBUS DAY

Suggestive Programs

I

Roll Call—Cities, Rivers and Countries named for Columbus
Song, *America*
Columbus.....*Joaquin Miller*
Essay, *Early Life of Columbus*
Columbus.....*T. C. Adams*
Dialogue, *From the Old World to the New*.....*L. M. Hadley*
Christopher C—
Columbus to Ferdinand.....*Mason*
Essay, *The First Voyage of Columbus*
Columbus.....*Olive E. Dana*
Essay, *The Second Voyage*
Columbus Crossing the Atlantic.....
.....*Arthur Hugh Clough*
Essay, *The Third Voyage*
Columbus in Chains..*Marie J. Jewsbury*
Song, *Columbia My Land*

II

Song, *Hail Columbia*.....*Hopkinson*
Essay, *What Columbus Knew About the World*
Columbus.....*L. H. Sigourney*
Mrs. Christopher Columbus.....
.....*M. S. Cowell*
Dramatization, *Columbus Before Ferdinand and Isabella*
Columbus at the Court of Spain.....
.....*Mrs. L. E. Boyd*
Dialogue, *Queen Isabella's Resolve*..
.....*Epes Sargent*
Essay on *Courage*
Columbus.....*Aubrey De Vere*
Dramatization, *The Landing of Columbus*
Song, *Columbia, the Gem of the Ocean*

the name had become too firmly fixed. On the four-hundredth anniversary of the first voyage of Columbus, in 1492 and 1493, there was held in Chicago a great exhibition to honor his name, and this was called the World's Columbian Exposition. A.B.H.

Consult Irving's *History of the Voyages and Life of Columbus;* Prescott's *Ferdinand and Isabella;* Fiske's *The Discovery of America.*

Related Subjects. The following articles in these volumes will be found helpful by the reader interested in Columbus and his discoveries:

Caravel
Ferdinand
Haiti
Isabella
Polo, Marco
Vespucius, Americus
World's Columbian Exposition

COLUMBUS, GA., a leading cotton manufacturing city of the South, with a population, chiefly American, of 31,125 in 1920, an increase of 10,571 since 1910. It is the county seat of Muscogee County, and is situated on the western border of the state, at the head of navigation on the Chattahoochee River. Atlanta, the state capital, is 116 miles northeast; Montgomery, Ala., is ninety-four miles west, and Birmingham is 157 miles northwest. Railway accommodations are afforded by the Seaboard Air Line, the Central of Georgia and the Southern railways. Steamers ply regularly between Columbus and Apalachicola, Fla., and there is also water connection with Saint Andrew's Bay. The area is nearly three square miles.

Columbus is in the center of a fertile agricultural section, with forests of hardwood and deposits of coal and iron in the vicinity. It is the distributing center for Southwestern and Central Georgia. Abundant power for manufacture is furnished by the Chattahoochee River, which here has a fall of 120 feet. Three large companies in 1916 were making this power further available by the construction of dams. The cotton industry is paramount in Columbus; it is called the *Lowell of the South,* on account of its extensive manufacture of cotton goods. Eleven mills employ about 5,000 people, consume 350,000 bales of cotton annually, produce 36,000,000 pounds of cotton goods and 2,000,000 pairs of hosiery. There are also two cotton compresses and cottonseed-oil mills. The ginning mills are among the largest in the world. Next in importance to the cotton industry, and equally as old, is the iron industry. The manufactories of the city also produce agricultural implements, store and office fixtures, paving material, syrup and beverages.

Among the notable buildings are the $150,000 post office, constructed in 1893; a hotel built in 1915 at a cost of $250,000; a $100,000 Industrial High School, built in 1906; a $100,000 marble Y. M. C. A. building; a $157,000 Carnegie Library, completed in 1907, and a city hospital which cost $75,000 in 1915. The city has wide streets, and 170 acres are assigned to parks. Girard, Ala., a suburb of Columbus, is on the opposite bank of the river, which is spanned by a bridge.

Columbus was the first city of the South to adopt graded schools and manual training. There are night schools, kindergartens, a primary industrial school for the children of the poorer wage-earners, and a provision for "the little dinner carriers" who carry dinners to relatives at work; study hours are regulated for their convenience. In addition to these the city has two schools for girls, a Catholic academy, two schools of music, a business school and a library.

Columbus was settled in 1827 and named for the discoverer of America; it was incorporated as a city in 1836. As early as 1845 it was a cotton center and had a cotton mill. During the War of Secession the Southern armies depended on Columbus for their clothing and ammunition. It was here the last battle of the war was fought, the city being taken in April, 1865, by General Wilson. L.J.H.

COLUMBUS, Ind., the county seat of Bartholomew County, in the southeastern part of the state, forty-one miles southeast of Indianapolis. The town was settled in 1821 and chartered as a city in 1864. It is on the east fork of the White River, and on the Pittsburgh, Cincinnati, Chicago & Saint Louis, the Cleveland, Cincinnati, Chicago & Saint Louis, and the Indianapolis, Columbus & Southern Traction (electric) railroads. The area is two and a half square miles. The population, which in 1910 was 8,813, was 8,990 in 1920. Twelve miles east of the city is Hope, a Moravian settlement.

The city has several parks, a Federal building, county courthouse, city hall, Carnegie Library and Bartholomew County hospital. Important industrial plants include manufactories of mahogany furniture, tanned leather, pulleys, threshing and sawmill machinery, gasoline engines, transmission gears, starch, etc. The annual output of these plants exceeds $4,500,000 in value. L.J.L.

COLUMBUS, Miss., an industrial and educational city with a population of 8,988 in 1910, which increased to 10,501 in 1920. About one-half of this number are negroes. It is the county seat of Lowndes County, and is on the Tombigbee River, north of the central part of the state, about eight miles west of its eastern border. Meridian is ninety-eight miles south, Jackson, the state capital, is 150 miles southwest, and Birmingham, Ala., is 122 miles east. The city is served by the Southern Railway, constructed to this point in 1888, and by the Mobile & Ohio, built in 1859. The city was founded in 1817 where Andrew Jackson's military road to New Orleans crossed the river, was incorporated in 1821, and named for Christopher Columbus.

Columbus is in one of the richest black prairie sections of the South, and agriculture is the principal source of its wealth. There is an abundance of cotton, timber, corn, alfalfa, fruits and vegetables, and the cultivation of tobacco is increasing. The principal industries are cotton mills, lumber mills, fertilizer plants, bottling plants and brick factories. The shops of the Southern and the Mobile & Ohio railways are located here. The most notable buildings are the post office, constructed in 1911 at a cost of $60,000; the $88,000 First State Bank building, and that of the Columbus National Bank, which cost $66,000 in 1907. The Mississippi Industrial Institute and College at Columbus was the first college maintained by any state for the exclusive education of women. It includes a science hall, hospital, music hall and gymnasium; about 800 students are enrolled. Franklin Academy and Union Academy (colored) also serve the educational interests. W.H.C.

COLUMBUS, Ohio, the capital of the state and the county seat of Franklin County, is situated at the junction of the Scioto and Olentangy rivers, near the geographical center of the state, on a level plateau 1,000 feet above sea level. Toledo is 132 miles northwest, Cleveland 170 miles northeast, and Cincinnati 120 miles southwest. The area of the city exceeds twenty-two square miles. The population in 1900 was 125,560; in 1910 it was 181,511 and in 1920, 237,031.

Streets and Buildings. The general plan of the city resembles a maltese cross. The two main streets, Broad and High, run east-west and north-south and intersect at right angles. High street, the main business thoroughfare, is 100 feet wide and eight miles long. Broad street, a residence avenue, is 120 feet wide and seven miles long; parking divides this street

into a central portion for heavy vehicles and narrower roads on both sides for pleasure vehicles. At the intersection of Broad and High streets and two blocks from the Scioto River is Capitol Square, a park of ten acres, in the center of which stands the state capitol. It is constructed of native gray limestone, in the Doric style of architecture. The length of the building is 304 feet; the width, 184 feet. A cylindrical rotunda 158 feet high rises from the center, upon the walls of which is the painting by William H. Powell of *Perry's Victory on Lake Erie.* Portraits of most of Ohio's governors and a piece of sculpture by Thomas D. Jones representing the surrender of Vicksburg by Pemberton to Grant are art treasures contained in the capitol.

The judiciary buildings are connected with the capitol by a stone terrace. The first state houses were of brick, and cost $85,000. The present massive structures cover nearly three acres, and were erected at a total cost of $2,500,000. At the west entrance to the square is a beautiful McKinley Memorial Arch, sculptured by H. A. McNeil. On the capitol grounds is a group of statuary comprising monuments to Ulysses S. Grant, Rutherford B. Hayes, James A. Garfield, Willam T. Sherman, Philip H. Sheridan, Salmon P. Chase and Edwin M. Stanton.

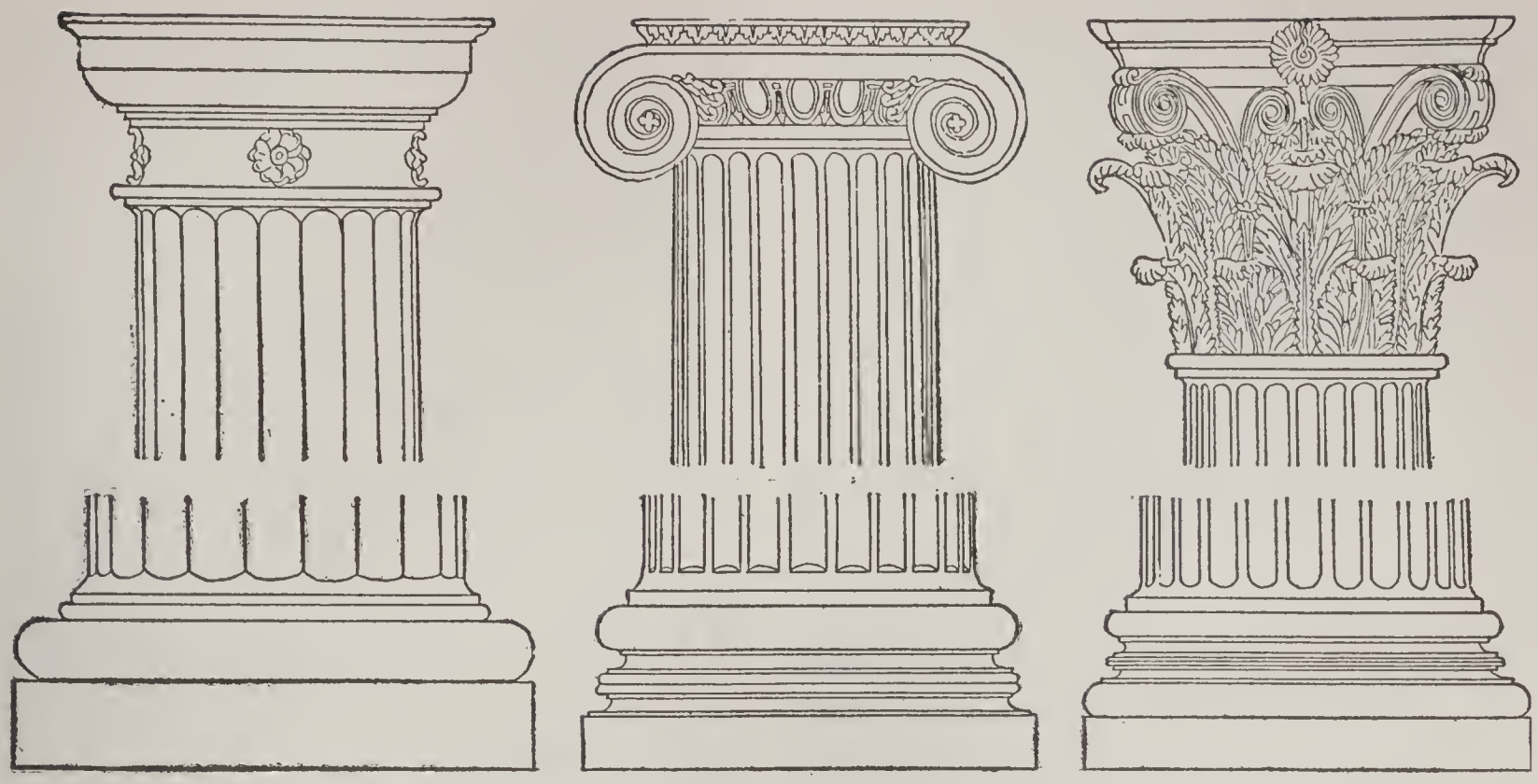
Prominent buildings facing the capitol about the square are the city hall, the Chamber of Commerce, the post office and the Y. M. C. A. On Broad Street is the Soldiers' and Sailors' Memorial building, with a seating capacity of 4,500. Other prominent structures are the United States pension building, Franklin County courthouse, union station, United Commercial Travelers' Home, Masonic Temple, the state penitentiary (one of the oldest in the United States, where Morgan and his raiders were imprisoned during the War of the Secession), the Columbus State hospital and the public library.

Institutions. The Ohio State University (which see) is situated in the northwestern part of the city, on a beautiful campus of 440 acres extending along the Olentangy River. Other important educational institutions include the Capital University and Theological Seminary (Evangelical Lutheran), the Ohio Medical University, the Ohio Agricultural and Mechanical College and the Columbus Art Institute. The Ohio State Library occupies a room in the capitol. It contains a large traveling library, from which responsible organizations or individuals in any part of the state may borrow books. Other public libraries are the city library, the law library of the supreme court of Ohio and the university and public school libraries. Columbus is the seat of the state institution for the education of the deaf and dumb, the Institution for the Blind, the Asylum for Imbecile Youth and the Central Insane Asylum.

Parks. Throughout the city are a number of attractive parks having a combined area of nearly 300 acres. The largest of these are Franklin, Goodale, Glenwood, Livingston, Schiller, Nelson and Lincoln. The Ohio state fair grounds are in the northern part of the city. Close in, northeast of Capitol Square and occupying a park of eighty acres, is Fort Columbus, an army post, called also Columbus Barracks.

Industries. Industrially Columbus ranks fourth among the cities of the state. It is one of the greatest railroad centers in the United States, and is on or directly connected with all of the important roads of the East. Eleven electric railways operate out of Columbus. Near-by are large coal beds and oil and gas wells. There are over 800 manufacturing plants in and close to the city, employing 35,000 people and producing $85,000,000 worth of products annually. The most important manufactures are foundry and machine-shop products, such as mining and conveying machinery, contractors' equipment, steel cars, steel castings, etc. Columbus ranks twelfth among the cities of the United States in shoe manufacturing. Tile, regalia, couches, dental supplies, piano stools, paint and varnishes are among the most important of scores of manufactured products. The city is a great shipping center for every kind of grain.

Historical. The first settlement on the present site of the city was made on the west bank of the river in 1797, and named Franklinton. In 1812 the city was made the state capital, and a new location was planned across the river, on what was then heavily-timbered land. In 1816, at the time of the first meeting of the legislature on the new site, the settlement was incorporated as the borough of Columbus. The Columbus branch of the Ohio Canal was completed in 1831. The borough obtained a city charter in 1834 and in 1871 annexed the greater part of Franklinton, the older town across the river, which had never been incorporated. A new city charter, effective in 1916, provided for a modified Federal



THE THREE STANDARD COLUMNS IN ARCHITECTURE
From left to right, the Doric, Ionic, Corinthian. For further illustration of parts, see page 324.

form of government. The public utilities owned by the city are the lighting plant, the water works and garbage collection and reduction plants.

March 25, 1913, Columbus suffered from a disastrous flood which caused the death of nearly 100 persons and a total property loss amounting to over $20,000,000. D.K.M.

COLUMN, *kol'um,* in architecture, a vertical structure, or pillar, designed chiefly to form a means of support for a weight above, usually serving both to strengthen and adorn. It may be constructed of any material—stone, wood, metal, marble or brick. The typical column consists of three parts, the *base, shaft* and *capital.* The shaft, which is the central, upright portion, is usually cylindrical in shape, though it may be modeled on any regular geometrical figure. The base is the lowest part, supporting the shaft, which is crowned by the capital.

In ancient architecture the column appeared in a great variety of sizes and forms. The Egyptians, who used this architectural feature from a very early period, favored the heavy and massive type of column, represented by the great central pillars of the Hall of Karnak, which were seventy-five feet high and fifteen feet in diameter (see full-page illustration, EGYPT). The Persian column was generally tall and slender, in this respect resembling the Greek.

The Greek Orders of Architecture. Among the Greeks the column was developed to a high degree of perfection, the styles of base, shaft and capital conforming to special rules which made possible their classification into the three classic orders of architecture, the *Doric,* the *Ionic* and the *Corinthian.* These are picturesquely described in Thompson's *Ode to Liberty:*

First, unadorned
And nobly plain, the manly Doric rose;
The Ionic then, with decent matron grace,
Her airy pillar heaved; luxuriant last,
The rich Corinthian spread her wanton wealth.

Doric Column. This, the oldest and simplest of the three types, has a plain shaft which tapers slightly upward, the height of this being from five to seven times its lower diameter. Along the shaft are sixteen to twenty vertical, shallow grooves, or flutes, which meet in sharp edges. The capital has two parts of equal thickness. The upper, a square block, or plinth, called the *abacus,* rests upon the lower, a circular tablet called the *echinus.* Above the capital is a structure known as the *entablature,* consisting of three parts: the *architrave,* directly above the column; the *frieze,* or middle portion; and the *cornice,* or highest part. One of the most celebrated examples of Doric architecture was the stately Parthenon, on the Acropolis of Athens (see PARTHENON).

Ionic Column. The slender Ionic column, invented by the Asiatic Greeks, is a more graceful and decorative structure than the Doric. Its shaft, in height from seven and one-half to nine and one-half times its diameter, rises from a circular base to a capital adorned with scrolls, or volutes, connected by a horizontal band. Along the shaft are twenty-four flutes, separated by narrow, flat surfaces. Among the finest examples of Ionic architecture were the Temple of Diana at Ephesus and the Erechtheum at Athens.

Corinthian Column. The most ornamental column is the Corinthian. It is a variation of Ionic, having a slender, fluted shaft, but a more

elaborate capital. The latter consists of a bell-shaped core surrounded by one or two rows of acanthus leaves, above which are pairs of branching scrolls meeting at the corners in spiral volutes. Famous among the examples of Greek Corinthian art is the Monument of Lysikrates, at Athens.

The Roman Orders. Under the Romans the column became an architectural feature of wonderful variety and beauty. Five orders are usually assigned to them, the Tuscan, Doric, Ionic, Corinthian and Composite. The Tuscan is an elementary Doric with a column seven diameters in height. Their Doric column, borrowed from the Greek, is generally provided with a simple molded base, which rests on a square plinth. The Greek Ionic they adopted with very little change, but the Corinthian was greatly enriched and elaborated, becoming a distinct Roman order. To these four they added the Composite, formed by combining into one capital portions of the Ionic and Corinthian capitals, and especially pleasing to the Romans because of its rich ornamentation.

Columns designed to serve as memorials to famous personages and events were greatly favored by the Romans, who erected for this purpose massive towerlike columns fitted with interior staircases. Representative of these were Trojan's Column and the Column of Antonine.

Columns of Later Periods. In early Christian and medieval European architecture the column was used freely and in a variety of forms, with notable modifications of the shafts. These were often spiral, twisted or knotted, and were employed more often in groups than singly, chiefly as supports for arches. The interior of the beautiful Cathedral of Notre Dame, at Paris, begun in 1163, affords a conspicuous example of the combination of arch and shaft. With the Renaissance there came a revival of all the Roman types of column, together with the invention of new forms of the shaft. Of special note are the colonnades of Saint Peter's Church in Rome and of the Louvre, in Paris. In modern architecture the Greek, Roman and Renaissance types of columns are used in public buildings and in large business structures to give an effect of grandeur. See ARCHITECTURE. B.M.W.

COMANCHE, *ko man' che,* a tribe of Indians closely related to the Shoshoni of Wyoming. When first known they occupied Eastern Colorado and the territory southward to the boundary of Mexico. They were among the most skilful and daring horsemen of the plains, and were extremely warlike, being constantly at war with the Spaniards. When Texas became independent they were driven from their best hunting grounds and for years waged war on the Texans. Later they engaged in border warfare with the United States troops, and it was not until 1875 that they surrendered and were placed on a reservation in Western Oklahoma, where they now live. They are slowly decreasing, numbering now about 1,100. For customs and habits, see INDIANS, AMERICAN.

COMBUSTION, *kom bus' chun,* in the ordinary meaning of the term, is the union of oxygen with some substance which will produce light and heat. We ordinarily think of combustion only in connection with fire, but in its broadest meaning the term is much more widely extended. From the viewpoint of the chemist any union of oxygen with another substance is combustion. The burning of chlorine in hydrogen is combustion, as is also the burning of any substance in chlorine.

The temperature of the burning substance depends upon the rapidity of the combustion. The amount of heat generated in the burning of a given substance, as a ton of coal, is always the same, if quality is unchanged, regardless of the time required in its combustion. If the coal burns slowly the temperature is lower than when it burns rapidly, but the slow-burning requires a proportionately longer time. See FIRE, for description of how combustion causes fire.

Spontaneous Combustion. Heaps of rags soaked with oil, or piles of bituminous coal which contains moisture and some other substances, occasionally take fire without being ignited from some outside source. Burning of this sort is termed *spontaneous combustion.* The fire is caused by the union of oxygen with the carbon and hydrogen in the substance with such rapidity as to raise the temperature above the igniting point. Very disastrous fires have been started in this way.

Superstitious people sometimes think that death is caused by spontaneous combustion. In *Bleak House,* Dickens attributes the death of the "Lord Chancellor of the Rag and Bottle Shop" to this cause, and vividly sets forth some of the circumstances. In the preface to this work Dickens declares his description to be based on historic facts, but the theory is now rejected.

COMEDY, *kom' e di,* that branch of the drama which appeals to the sense of humor, keeps its readers or audience in a cheerful

frame of mind and has a happy ending. It is to be distinguished on the one hand from *tragedy,* with its serious manner and unhappy ending, and on the other from *farce* and *burlesque,* which depend on a broader, more exaggerated humor for their appeal. In its broad sense, however, comedy includes farce and burlesque. See DRAMA.

The word *comedy* means a *revel* or a *festival,* and this particular type of the drama grew out of the old festivals in honor of Bacchus (which see). In these a witty, sharp-tongued fellow, drawn about in a cart, would stop at intervals and make sport of the spectators, of the manners of the times, even of the men in power; and gradually this species of ridicule became more formal and shaped itself about a central plot. In modern times comedy does not rank so high, perhaps, as tragedy, but some of the greatest writers have turned their genius to it and have produced works that will live. There are Shakespeare's *Much Ado About Nothing, As You Like It, Twelfth Night* and *Comedy of Errors,* for instance, and Molière's *Miser, Misanthrope* and *Imaginary Invalid.* These two authors are the greatest masters of comedy, but Goldsmith produced one comedy of note, *She Stoops to Conquer,* and Sheridan two, *The Rivals* and *The School for Scandal.* All of these continue deservedly popular.

Among the comedies of recent times have been Shaw's *Man and Superman, Arms and the Man, Candida, Androcles and the Lion* and *Pygmalion,* Barrie's *What Every Woman Knows, Quality Street* and *The Little Minister* and Pinero's *The Mind-the-Paint Girl.* America has produced few if any playwrights whose works have the qualities which make for permanence, but the names of Denman Thompson, James A. Herne, Bronson Howard, Clyde Fitch, David Belasco, Percy Mackaye, Augustus Thomas, George M. Cohan and others are well known to the theater-going public. The preference of the theater-going public has been strongly for comedy in recent years, or for that sort of tragedy which resembles comedy in that nobody dies, the tragic element being all spiritual, and in that manner is light, almost flippant. C.W.K.

COMENIUS, *ko ma'ne oos,* or *ko me'ni us,* JOHN AMOS (1592-1671), the man who published the first illustrated text-book in the world, and the pioneer in modern educational methods. His parents died when he was a young child, and he was brought up by guardians and educated in the faith of the Moravian Church. He completed his education in the universities of Amsterdam and Heidelberg. Comenius began teaching at the age of twenty-two, and at once determined to reform the methods of instruction then employed. He characterized the schools as "slaughter houses of the mind" and "places where minds are fed on words." Two years after he began teaching Comenius was ordained a preacher in the Moravian Church, and although he rose to the rank of bishop in the Church of his adoption, he is nevertheless remembered chiefly by his work in education.

Comenius was a voluminous writer, but of his many works only two exerted a lasting influence on education. These are the *Gate of Tongues Unlocked* and *The World Illustrated;* the latter was the first illustrated text-book, a

The *Bee,*1 maketh honey which the *Drone,*2 devoureth. The *Wasp,* 3 and the *Hornet,* 4. molest with a sting; and the *Gad-Bee* (or Breese), 5. especially *Cattel*;

Apis, 1 facit mel quod *Fucus,* 2. depascit *Vespa,* 3. & *Crabro.* 4. infestant oculeo; & *Oestrum* (Asilus), 5. imprimis *pecus.*

A PAGE FROM *THE WORLD ILLUSTRATED*
Reproduced one-half the size of the original.

page of which is reproduced on this page on a scale one-half its original size. The first book completely changed the method of teaching languages, and within a few years it was translated into nearly all the languages of Europe and several of those of Asia. "For many generations the school boys of three continents thumbed this book as their primer to the languages." The other work was written to emphasize Comenius' principle that in teaching the *idea* should precede the *word.* Upon these works the fame of this great educator rests.

COMET, *kom'et,* a heavenly body, popularly regarded as a star with a tail, occasionally seen in the sky. It moves with tremendous veloc-

ity, although it is so far from the earth that it appears from day to day apparently stationary. The name is derived from the Greek word *kometes,* which literally means *long-haired,* in reference to the beard or tail which usually precedes or follows the comet. Few comets are visible to the naked eye, though some have tails many millions of miles in length. About 800 comets have been recorded, but there are probably thousands that cannot be detected by the most powerful instruments. Apparently, comets consist of three parts—the nucleus, or bright, starlike portion; the *coma,* or mass of matter surrounding it, and the *tail.* The three parts are not always clearly defined, however, and the comet may appear merely as a luminous haze.

The tail is formed by a mass of gaseous matter scattered by the nucleus of the comet itself. As it approaches the sun the tail is behind the nucleus; as it travels away from the sun the tail precedes it. In other words, the matter of which the tail is composed is repelled instead of being attracted by the sun. It is generally believed that comets are nebular masses surrounding a nucleus, or center of meteoric particles which in their course through space have been captured by the attraction of some planet, around which they then revolve. This revolution periodically brings them under the attraction of the sun, causing them to approach sufficiently near to become visible from the earth. Thus, Neptune is known to have a family of six captive comets, which will revolve round that planet until captured by some superior force.

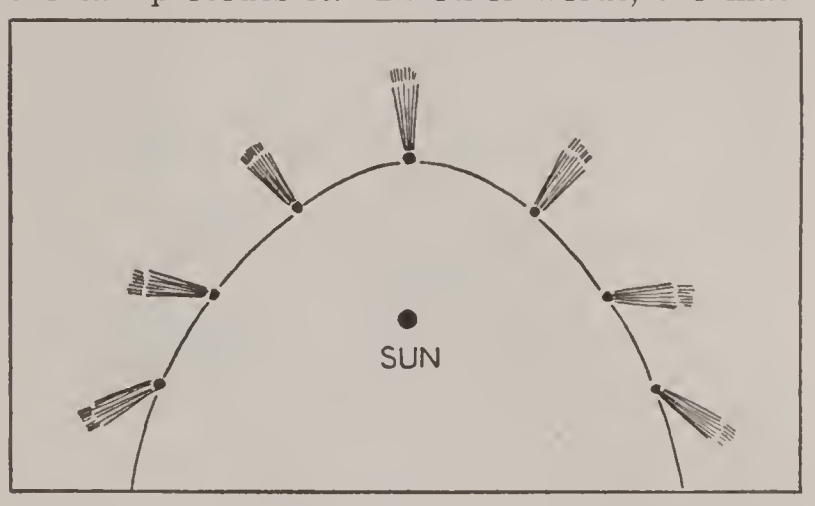
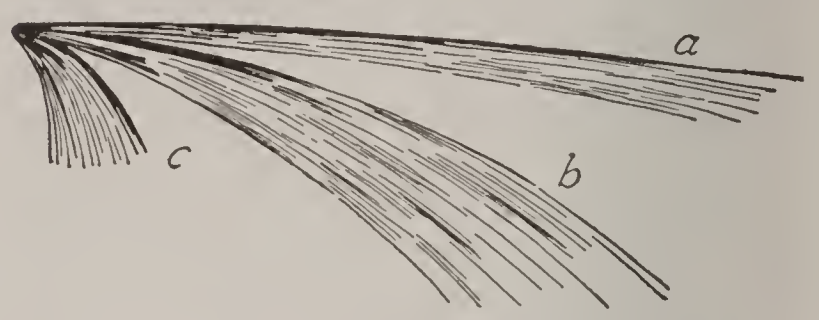


Diagram showing how a comet's tail always points from the sun.

A comet may be visible for a week, a month or even as long as two years. Sometimes the approach to the sun is in the form of a parabola (which see), from far beyond the solar system. It may sweep in a mighty curve part way round the sun, then branch away at an angle, to disappear in space without ever again becoming visible. The last comet seen without the aid of a telescope was Halley's comet, named after its discoverer. Halley announced in 1705 that this visitor would return in 1759, 1835 and 1910, and his predictions were fulfilled.

In addition to Halley's comet the most important have been Lexell's, appearing in 1770 without being seen since; Biela's, which in 1845 broke into two parts, and Enckes', which returns at regular intervals of about three years. In 1858 the most remarkable of all comets was discovered by Donati. It was singularly bright and was watched by astronomers with great interest.



THREE TYPES OF COMET TAILS

(*a*) Long, almost straight, and composed perhaps of hydrogen; (*b*) curved, supposed to be hydrocarbon vapors; (*c*) short and stubby, probably metallic vapors of considerable density.

It has always been customary among superstitious people to regard the appearance of a comet as a portent of disaster. The appearance of a comet in 1456 caused such terror that in every Christian church in Europe the prayer, "Lord save us from the Devil, the Turk and the comet" was added to the service. Science has so thoroughly explained the phenomenon, however, that it is only the most ignorant who regard such an appearance as otherwise than natural. What would happen if the earth collided with a comet's tail in its path would probably be merely a dust storm, and nothing in any way terrifying. F.ST.A.

Related Subjects. The following articles in these volumes contain information which will be helpful to the reader interested in this topic:

Astronomy	Nebula
Halley, Edmund	Parabola
Meteor	Star

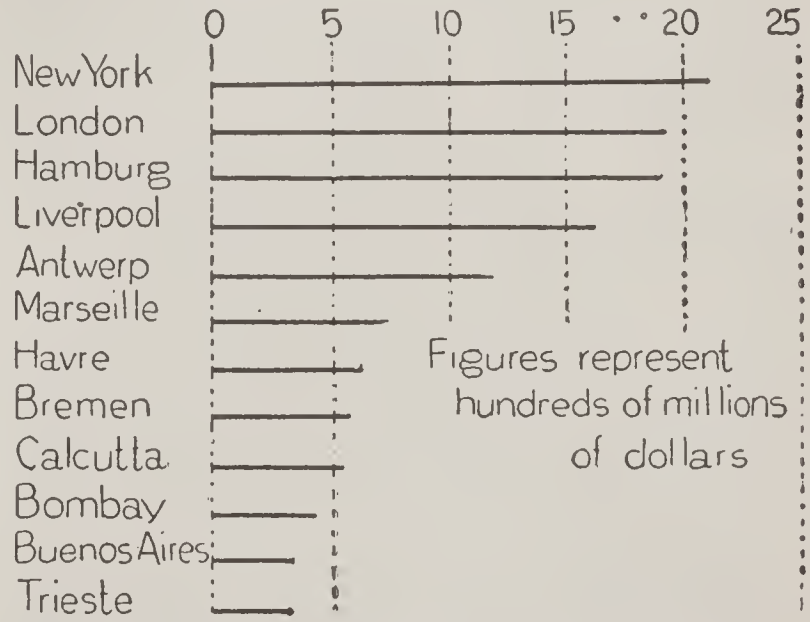
COMITIA, *ko mish'i ah,* the legal meetings of the ancient Romans, in which the people, summoned by a magistrate, voted on questions relating to the state. They are thus to be distinguished from the *contiones,* or mass meetings. The oldest form of assembly was the *Comitia Curiata,* or assembly by *curiae* (wards), the members of which belonged to the patrician, or favored, class. This assembly made laws, determined upon peace and war and elected the king.

In the reign of Servius Tullius a new assembly was created, the *Comitia Centuriata,* in which the vote was taken by units containing 100 or more persons, and which were called *centuries.* This assembly, which was made up of both patricians and plebeians, gradually took over the powers of the earlier body. The third assembly, the *Comitia Tributa,* the assembly by tribes, was the democratic body of Rome. It met in the Forum, and in the course of time gained a position of supreme importance. According to the best authority, the *Comitia Tributa* was composed entirely of plebeians. See PATRICIAN; PLEBEIAN.

COMMERCE, *kom'erce,* a word meaning literally *an exchange of commodities,* but in common use restricted to an exchange between nations, as opposed to trade, which is local. Commerce is one of the first developments of civilization; barbaric communities or nations are almost necessarily self-supporting; they must find at home everything necessary to support life. It has been, from the earliest times, one of the factors which have preserved friendly international relations, for a nation's surplus products, which represent its accumulation of wealth, can be sold only to other nations with which it is at peace.

The first method of trade and commerce was *barter,* or the exchange of one commodity for another. This was soon made simpler by the use of money (which see), and with the further development of industry and civilization exchanges became so common that some men devoted themselves entirely to conducting them. This class became known as the merchants, the persons who dealt in *merx* (the Latin word for wares and merchandise). The first merchants who traveled from one region to another to dispose of their wares were the Arabs, who journeyed overland by caravan (which see), but the greatest merchants of antiquity were the Phoenicians and the Carthaginians.

Commerce between Europe and the Far East was greatly stimulated by the Crusades, but international trade did not become general until the sixteenth century. The discovery of America was due primarily to the desire to find a short route to India, and in turn stimulated further discovery and exploration of new fields of commerce. Each European country began to guard with greater care the colonies it had established and tried to restrict their trade with other nations than the mother country. It will be remembered that England endeavored to force the American colonies to trade only with Britain. The wars of the eighteenth century and the Napoleonic era destroyed nearly all commerce, but the discoveries and inventions of the nineteenth century began a new age. The steamboat, the railroad, the telegraph, the telephone, even the wireless telegraph, have all played their part in trade development.



PRINCIPAL PORTS OF THE WORLD
The twelve cities which possessed the greatest foreign commerce before the War of the Nations.

Once commerce was restricted to commodities of great value in small bulk, such as precious stones. To-day cheaper methods of transportation make it possible to ship not only precious articles, but bulky raw materials, for long distances. Not only that, but it is now possible to transport perishable commodities by refrigeration, or cold storage (which see), to

the very ends of the earth. The people of London, for example, eat butter and eggs from Denmark, beef and mutton from the Western United States or from Argentina, apples from Ontario, oranges from California. The bread they eat is made from wheat raised in Saskatchewan, North Dakota or Minnesota, their tea comes from Ceylon or Japan, and their coffee is raised in Brazil or Arabia. In short, there is hardly a thing produced by nature or by man which is not an item in commerce. For details of the commerce of the world, see articles on the separate countries. W.F.Z.

Related Subjects. The following list of articles in these volumes which relate to commercial topics does not confine itself to the narrower sense of the word *commerce,* but includes articles bearing upon trade and various phases of business:

Accounting
Advertising
Auction
Auditor
Balance of Trade
Bears and Bulls
Bill
Bill of Exchange
Bill of Health
Bill of Lading
Bill of Sale
Board of Trade
Bonded Warehouse
Bookkeeping
Boycott
Bucketshop
Chamber of Commerce
Commercial Agency
Corporation
Department Store
Dun Commercial Agency
Exchange
Express Company
Fair
Federal Trade Commission
Free Trade
Fur and Fur Trade
Good Will
Grace, Days of
Insurance
Interstate Commerce Act
Joint Stock Company
Lloyd's
Meat Packing
Merchant Marine
Monopoly
Partnership
Pawnbrokers
Profit
Profit Sharing
Receipt
Receiver
Standard Oil Company
Stock, Capital
Stock Exchange
Trade Mark
United States Steel Corporation

COMMERCE, CHAMBER OF. See CHAMBER OF COMMERCE.

COMMERCE, CHAMBER OF, OF THE UNITED STATES. See CHAMBER OF COMMERCE OF THE UNITED STATES.

COMMERCE, DEPARTMENT OF, the ninth executive department of the United States government, originally established in February, 1903, as the Department of Commerce and Labor. In 1913 the Department of Labor (which see) was organized as a separate department. The Department of Commerce "fosters, promotes and develops the foreign and domestic commerce, the mining, manufacturing, shipping and fishing industries, and the transportation facilities of the United States." This Department has charge of the promotion of American manufactures, the census, statistics, lighthouses, coast survey and steamboat inspection.

The Department organization includes many important Bureaus, such as the Bureau of Foreign and Domestic Commerce, Bureau of Lighthouses, Bureau of the Census, Coast and Geodetic Survey, Steamboat Inspection Service, Bureau of Fisheries, Bureau of Navigation and Bureau of Standards. When the Department of Commerce and Labor was established two new Bureaus of first importance were created, the Bureau of Manufactures and the Bureau of Corporations, and it was largely because of the necessity of these two that the Department was originally organized. The former remains a part of the present Department of Commerce, but the work of the Bureau of Corporations is now in the hands of the Federal Trade Commission (which see).

At the head of the Department is the Secretary of Commerce; he is a member of the Cabinet of the President, but is not eligible to succession to the Presidency, as are the first seven members of that body (see PRESIDENTIAL SUCCESSION ACT). The secretary receives a salary of $12,000 per year.

COMMERCIAL AGENCY. Wholesale dealers and manufacturers in large cities have many customers scattered throughout rural districts and smaller towns. Most of these customers usually wish to purchase goods on credit. Before the dealer can sell on deferred payments he must know the financial standing of customers, their reputation for honesty, and other facts pertaining to them to serve as a basis for credit. Since it is impracticable for dealers to gain this information themselves, they are willing to pay reliable firms to do it for them. Such firms are *commercial agencies.* The best of these agencies are very reliable and are considered authorities in their field. They issue an annual guide to their subscribers which gives the financial standing and credit of every firm of any importance in America, and sometimes in the leading European countries. These ratings are denoted by letters and figures which are disclosed by a key, and those not acquainted with the system employed are unable to interpret the symbols. The two leading commercial agencies of America are Dun & Company and Bradstreet's.

COMMERCIAL LAW, the branch of law which relates most directly to every-day mercantile transactions which are based on or modified by the usage of trade. The body of

rules constituting this law is to a great extent uniform throughout the commercial world, the treaties and decisions of one country being applicable to the questions arising in any other, with due allowance for local differences of commercial usage. These rules embrace the law of shipping, bills of exchange, insurance, bankruptcy, brokerage, partnership, negotiable paper, promissory notes, contracts, etc. In the United States the term includes the law dealing chiefly with contracts. Much of the law on these subjects is of ancient origin, being derived from the Roman civil law, the custom of merchants and international law. See CONTRACT; NOTE, and other subdivisions named above.

COMMERCIAL PAPER, a term synonymous with NEGOTIABLE PAPER, which see.

COMMISSIONER OF EDUCATION. See EDUCATION, subtitle *Commissioner of Education.*

COMMISSION FORM OF GOVERNMENT, a city government born of the flood disaster which devastated Galveston in 1900. That disaster disorganized the usual forces of law and order and left the city temporarily at the mercy of groups of plunderers. Three men emerged from the crisis, took power into their own hands and were valiantly supported by all good citizens. These self-appointed men exercised for a brief time all the powers formerly held by the city council, mayor, chief of police and police judge. So successful was this temporary government with powers in the hands of three men that Galveston adopted the plan permanently, and called it the *commission form of government.*

Within a few years other cities one by one hesitatingly tried the same experiment; it met every condition of local government and the plan spread rapidly. Commission government has since replaced the old forms of municipal government in hundreds of cities and towns. This governmental form merges the legislative duties, formerly exercised by a city council, and the executive powers, formerly held by a mayor, in a small commission, usually composed of five members. This commission is elected by the citizens at large, without regard to ward boundaries, class distinction or party politics.

Advantages of the System. The first great advantage of the commission plan of government is that it concentrates power and responsibility in a few hands. In other words, it makes the government of the city more like that of a business corporation, in which large powers are placed in the hands of a small board of directors.

A second advantage of the commission form is that it lessens the influence of political parties in local affairs. In the election of commissioners, nominations by political conventions and the use of party names and symbols are commonly done away with. The voters, having to choose but three or five men instead of a host of officials, can exercise wisdom in their balloting. The names of candidates are printed in alphabetical order, without party name or emblem.

Working Plan of the Commission. The law of Iowa, which may be taken as typical, divides the different departments as follows:

Department of Public Affairs, with the mayor at the head.
Department of Accounts and Finance.
Department of Streets and Public Works.
Department of Parks and Public Property.
Department of Public Safety.

The five members of the commission sitting together decide policies, pass ordinances, levy taxes and make the city budget. The commissioners give their entire time to managing the affairs of the municipality, and receive adequate salaries for their services.

The Des Moines Plan. The form of government now known as the Des Moines Plan differs considerably from that which originated in Texas. Fundamentally, it is the usual commission plan, with certain important additions, including the referendum, the initiative, the recall and non-partisan primaries.

The citizens have the right by vote to recall the commission, or any member of it, at any time, if displeased with his official conduct. They also have the right to veto the commission's acts through the referendum, and to originate legislation by means of the initiative. Candidates for the commissionership seek election as citizens, on policies, or platforms, of their own suggestion, not as partisans on a party platform. Instead of being accountable to a political party, they may be called to account only by the people who elect them.

The commission form of government has now been adopted by over 400 cities. Of the 229 cities with over 25,000 population, ninety were governed under this plan at the beginning of 1922.

Related Subjects. Every city in the United States at the beginning of 1917 which had adopted the commission plan is on record in these volumes as a commission city. Reference

to any city of 10,000 population or over will disclose whether or not it has adopted the plan. In addition, see the following articles:

City
City Manager
City Planning
Initiative and Referendum
Recall

COMMITTEES OF CORRESPONDENCE, committees of patriots appointed during the American Revolutionary period, first by the towns of New England, then by the legislatures of the colonies, to prepare and circulate statements of American grievances and to secure protection against the claims of England. In November, 1772, Samuel Adams moved before the town meeting in Boston that a Committee of Correspondence be appointed to act in keeping in touch with other New England districts and to state the rights of the colony, the proceedings to be kept secret. The plan was a great success, a large number of towns responding at once. A permanent committee was later appointed to maintain correspondence with the sister colonies. Committees of a similar nature were afterward appointed by Connecticut, Rhode Island, New Hampshire and South Carolina.

COMMITTEE OF THE WHOLE, any organized body deliberating as a group. It is usual for legislative or other bodies to appoint certain committees, to which specific matters are referred. The committees investigate the subject and determine whether it is of sufficient importance to come before the larger body, and if so, in what form it should be presented. Occasionally, however, the whole body, sitting as a committee and with no more power than any other committee, debates the matter. Its action is deliberative rather than legislative; that is, it discusses the question in all its details. When its work is concluded it adjourns, or "rises from the committee"; the body then assumes its ordinary functions and formally receives the report of what it accomplished in committee of the whole.

When either branch of the Congress of the United States so sits, any member may be chosen to preside; in the British House of Commons a regularly-chosen chairman, other than the Speaker, presides over the committee of the whole. The Canadian House of Commons, when sitting as a committee of the whole, is presided over by the Deputy-speaker, the official assistant of the Speaker.

COM'MODORE, formerly the title of an officer in the United States navy ranking above captain and below rear-admiral. The rank was abolished by act of Congress in 1899, and all the commodores then in the navy were promoted to the rank of rear-admiral. Formerly when the fleet was divided into divisions, the commodore commanded a division.

COMMON CARRIER, a person or corporation whose business it is to transport passengers and goods, either by water or by land, for a price. The term, therefore, includes teamsters and omnibus lines, expressmen, street railways, railroads, steamboat companies and pipe lines; in recent years telephone and telegraph companies have been included by law, although they do not, strictly speaking, transport goods. Storekeepers and shop-owners who maintain a delivery service solely for the benefit of their customers are not common carriers.

The common carrier stands in intimate relation to the public, whose lives and property are in its care. Because of this confidential relation, the common law placed the carrier under two great obligations; first, its service is compulsory, for it must serve everybody who is able to pay; second, it is liable for loss or injury to goods or passengers carried. These general obligations have been regulated by statute in Great Britain, Canada and the United States. Interprovincial and interstate commerce are under the control of the national government, but the states and provinces also have individual jurisdiction. For this reason it is impossible to do more than summarize the responsibilities of common carriers.

Carriers of Goods. It is generally stated that common carriers are responsible for any loss or accident except those due to an "act of God or of the public enemy." In this sense an "act of God" means any unavoidable accident which occurs through no fault of a human being. The term "public enemy" includes pirates and any government which is at war with the government of the common carrier. Robbers, bandits and rebels are not regarded as public enemies. A carrier, moreover, is not liable for damages which arise from natural causes, such as fermentation, evaporation or decay unless by his neglect perishable articles, as fruit and vegetables, have been delayed in transit. If the shipper or the government authorities are in any way responsible for the loss or accident, the carrier is not liable. The liability of a carrier may also be limited by a special contract or agreement. Express and freight receipts, baggage checks and railroad tickets are not only receipts but are contracts in which the carrier invariably limits his liability.

Carriers of Passengers. Passenger carriers are subject to a few special rules of law. While they are ordinarily required to accept as passengers any persons who offer to pay the required fare, they need not carry drunken or disorderly persons, or anybody with a contagious disease, or fugitives from justice, or those who board a train for the purpose of committing crime. A person who has paid his fare and conducts himself properly has a right to ride to his destination; if he is forced to leave the train, the carrier is liable for damages. In every case the burden lies on the carrier to prove that he acted reasonably and within his rights, and that his negligence did not cause injury to the passenger. The carrier is not held responsible for passengers in the same degree as for goods, the assumption being that passengers are able to take some heed for themselves. So far as human foresight can ensure safety, however, a carrier is responsible for the lives of his passengers. See INTERSTATE COMMERCE ACT. W.F.Z.

COMMON COUNCIL, the name applied to the law-making body of a city or incorporated town, which may consist of two chambers, but is usually a single body. According to the typical organization of a city, the municipality is divided into districts called *wards,* each of which elects two *aldermen* for terms of two years, to form the city council. Usually one-half the members of this body retire every year. The chief executive officer is the *mayor.* A village differs from a city in organization in that the government is more simple. The village is not divided into wards, and the governing body is known usually as the *board of trustees,* six in number, elected by all the voters, one-half retiring each year. The chief executive officer is the *president* of the village.

Canadian cities and incorporated towns have councils consisting of from one to three councillors, or aldermen, from each ward. The legislative body of the village is also known as the council, and the chief executive officer may be a *mayor* or a *reeve.* See CITY; MAYOR.

COMMON LAW, the law distinguished from written or statutory law and derived from parts of the English law which do not rest for their authority on any express legislative act. Common law is therefore usually defined as the *unwritten law.* In this sense common law consists in rules and principles compiled from reports of adjudged or judicially decided cases, and from popular custom and usage, in contrast to statute law, equity and the civil law inherited by modern Europe and most of the states of America from the Roman Empire.

Common law is based primarily on customs growing out of the wisdom and experiences of mankind. In time these customs become recognized as consistent, reasonable and established, are sanctioned by the courts and are interpreted and made binding by the decisions of the final courts of appeal. The United States in the true sense has no common law. Federal courts when acting as common-law courts follow the law as it stands in the state where the action arises, accepting common-law principles wherever involved. The courts of each state have relied on the English common law until a fairly uniform system has developed throughout the country.

Related Subjects. The reader is referred to the following articles in these volumes:

Civil Law	Law
Equity	Statute

Also, for another body of laws, to CODE NAPOLEON.

COMMONS, HOUSE OF, the name given the lower house of the Parliament of Great Britain. See PARLIAMENT.

COMMON SCHOOLS. See SCHOOLS, subtitle *Public Schools.*

COM'MONWEALTH OF ENGLAND, the official name of the government of England during the period when the power was in the hands of the Parliamentary army and its leader, Oliver Cromwell; that is, from the execution of Charles I, in 1649, to the restoration of Charles II, in 1660. Though the name *Commonwealth* is usually associated with the entire period when England was ruled without a king, the government after 1653, when Cromwell became Lord Protector, is also known as the Protectorate.

BANNER OF THE COMMONWEALTH

Related Subjects. The entire story of the Commonwealth of England is summed up in the following articles in these volumes:

Charles I	England (History)
Charles II	Long Parliament
Cromwell	Restoration

COMMUNE, *kom mune',* corresponding to the *township* of the United States and the English *parish,* is the smallest district of local government in France. A commune has the power to buy and sell property, contract debts and appear in court. It is governed by a *maire,* or mayor, who is assisted by several deputies and the *conseil municipal,* a deliberative assembly. A commune may be a village of but a handful of people or a great city, like Paris.

COMMUNE OF PARIS, in French history, a name applied to two different governing bodies that ruled over the city of Paris. The Commune of 1792 was established during the French Revolution at a time when disorderly conditions in the capital and the timidity of the city authorities made extraordinary measures necessary. The regular officials were turned out of office by the leading citizens of the different wards, who organized themselves into a city council and governed Paris themselves. The power of the Commune increased until it overshadowed that of the National Assembly, and its history became the story of the Revolution itself. See FRENCH REVOLUTION.

The name is also applied to an organized mob which was in control of Paris from March 18 to May 27, 1871, at the close of the Franco-German War (which see). Almost as soon as the German army left Paris there were signs of revolt, and on March 18 the insurrectionists defied the authority of the regular French troops, took possession of the city and declared the National Assembly, in session at Versailles, to be without constitutional rights. The French government placed Marshal MacMahon at the head of the army, and on April 6 a siege of the city was begun. All opposition was crushed out by May 27, when the reign of the Commune came to an end. During the siege the Communists destroyed many public buildings, including the Palace of the Tuileries, the famous former royal palace of France.

COMMUNISM, *kom'u niz'm,* a theory of governmental and social order in which, when put into operation, property and the means of production are held as a common trust, and the profits arising from all labor are devoted to the general good. It is based on the theory that the individual should not hold property as his own. As a theory it has not only inspired some of the best characters in history, but also much of the gradual evolution of economic organization, especially in the case of coöperation.

Communistic schemes have found advocates in almost every age and in many different countries, but no communistic society has as yet been entirely successful, though many have been organized and some still exist. The most famous of these in the United States were New Harmony, Ind., established by the Englishman, Robert Owen, and Brook Farm, in West Roxbury, Mass. (see BROOK FARM). Of those still in existence, the Oneida Community in New York, which was converted in 1881 into a joint stock industrial company, and the Amana Society near Davenport, Ia., are of the most importance. See ONEIDA COMMUNITY; AMANA.

A.E.R.

COMMUNITY INTERESTS. The best thought of the world to-day is directed toward an ideal of universal peace; the realization of that ideal will mean that the nations of the earth have acknowledged and demonstrated that they are all members of one great family. On a small scale this "get together" sentiment is bringing into close fellowship the families that make up the community. It is serving to exalt the spirit of neighborliness, in itself a symbol of world unity. As someone has written:

The starting point of every good—
Of larger life—is Neighborhood.
Its fear-free banners now unfurled
Mean hope of peace to all the world.
If we can meet and join as one,
Here, from all lands beneath the sun,—
Then neighbor-nations, too, shall—in our time—
Forge world-wide union in a bond sublime.

In many communities one will find what may be called the "submerged element"—those who are kept from getting what they should out of life from a sense of their deficiencies. The handicap of poverty, of social inferiority, of physical weakness, or of whatever else it may be, has too often acted as a check to natural ability and promise. Whenever there is in any neighborhood a place where all may meet on a common level, as brothers and sisters of one community family, where the young people from the humblest homes join in the social and educational affairs of the center on the same footing as their more fortunate neighbors, then that neighborhood is working out in a wholesome way the problem of the submerged element. But even in a neighborhood where there is not this special problem, the "get together" spirit is one of the most encouraging phases of modern life. As this community-interest movement has come to stay, it will be well to examine the particular agencies by which it is perpetuated. One of these agencies is the Neighborhood Hall, a place where the individual may meet his friends, bring his family, and enjoy himself as freely as in his home. Recreation parks, containing gymnasiums, concert halls, playgrounds and the like, are getting to be common features of towns and cities and are serving to bring the people of the neighborhood into closer relationship. Probably the most influential phase of the movement, however, is the development of the public school as a community center. The good effects of this are no longer to be questioned; they have been proved.

The School as a Community Center

The utilization of school buildings as centers of community interests originated in the movement for a "wider use of the school plant." It was argued, and with reason, that it was a wasteful procedure to invest great sums of public money in buildings and equipment which were in actual service but a fraction of the time. Why should these costly buildings be closed every night in the week after four or five o'clock, during the school sessions, and be entirely idle in the vacation seasons? Why not throw them open when they were not occupied by the pupils, and let the people of the community utilize them for social, educational and other purposes? These were the chief arguments advanced, and in course of time they produced results. It was not long before the idea of a wider use of the school plant was generally accepted without argument, and the first step was thus taken toward making the school a center of community interests. For the success of this movement special credit is due Prof. Edward J. Ward, specialist in Community Organization, of the United States Bureau of Education.

One essential, however, was lacking. In a sense the schoolhouse became a community center, but not one in which were held the meetings of a united body of people, working with harmony of aim and unity of interests. For example, the building would be set aside at stated times for purposes of registration and voting. At such times the school principal would be without authority over the proceedings, and the premises would be occupied by half a dozen men quite out of harmony with the spirit of the school. Again, on one evening there would be a political meeting of the followers of a certain candidate, and on the next, a partisan rally for his rival. It was customary, also, to extend the use of the gymnasium and other parts of the building to athletic organizations of neighborhood churches and other bodies, each of which was quite independent of the rest. A school principal, writing of these conditions, summarized them in these words:

> There is no more unity of organization among the people who use the various free times and spaces of this school plant than there is among the people who happen to occupy the separated rooms of a hotel.

The story of the development of the school as a real neighborhood center is therefore the story of its expansion from a meeting place for unrelated groups to a real community *home*. To those pioneers who studied the problem in all its phases, it seemed logical that the use of the school plant for other than the regular sessions should be determined and controlled by the school authorities, and, with that idea as a basis, something of the nature of the following has been worked out as an ideal program for the construction of the community home.

The Community Forum. In any upbuilding of a harmonious community home there must of necessity be a preliminary organization of the adult citizens of the neighborhood, and to this end it has been found practicable to estab-

lish as a foundation stone the *community forum,* devoted to the presentation and open discussion of public questions. First, application for the use of the building should be made to the school authorities by means of a written petition, signed by a representative number of adult persons residing in the district. The school authorities, if they approve of the plan, should then define and fix the territorial limits within which members of the forum must reside; until details of organization are completed, the superintendent or principal of the school in which the meetings are to be held may act as clerk. The forum is organized in the same manner as literary, debating or similar societies; a constitution and by-laws are adopted, officers elected, the number and times of meetings mapped out, etc.

A very successful community forum has been established in Washington, D. C., in the Grover Cleveland School. With this forum Miss Margaret Wilson, daughter of President Wilson, became officially connected.

Some idea of the spirit which animated its founders may be gained from the words of the preamble to their constitution:

Whereas, we, the men and women of the neighborhood about the Grover Cleveland School, have a common and absolute responsibility for furnishing to the youth of this community a worthy and living example of proper civic devotion and a common opportunity to refine and clarify the intellectual life of this community to the benefit and enrichment of its every member; and

Whereas, to fulfil this obligation and realize this opportunity, it is necessary that there be established in our midst a public or community forum, which shall serve as the medium of our community membership, the place where we may go to school to one another in the understanding of the problems of our life together, and the instrument of our effective coöperation in the common interests; and

Whereas, the public schoolhouse furnishes the ready and appropriate headquarters for this genuinely public expression;

Therefore, we do organize and establish the Grover Cleveland Community Forum, to be used for the open presentation and all-sided discussion of public questions in the hearing and with the equal participation of the adult citizens of this community.

The Completed Community Center. The founders of the Grover Cleveland Forum were not content to have the movement stop with the organization of an adult association, and as a result of their efforts the Hollis-Johnson Community Forum Bill was drafted and introduced into Congress. This measure is recommended by its sponsors to each local community, to each state and to the nation as a whole, as furnishing a simple and practical plan for developing an ideal community center. It prescribes the method of organizing the forum, as suggested above, and then provides for the *completed community center,* of which the forum was the basis, as follows:

That whenever a public school building shall have been established as a community forum under the provisions of this act, and upon request to the board of education so to do by a majority of the adult persons present and qualified to vote at any regular meeting, the said board shall designate such building as a community center for the organized training and recreation of the young people of the community, including such activities as may be requested by the said adult organization and approved by the said board, and shall make all necessary and appropriate arrangements for the convenient and proper use of the building for community center meetings and activities, at such times as the said adult organization may request and the said board approve.

Those men and women who have given the community-center movement the deepest study believe that the proper official to hold the office of community executive-secretary is the principal of the school whose building is selected for the meetings. He acts as the director of the community center activities, and also as administrative agent for the forum. Provision is made in the Hollis-Johnson measure for this officer and two assistants, and a fixed rate of compensation for services rendered is also specified. Finally, there is a provision for payment of expenses, as follows:

It shall be the duty of the board of education to provide out of appropriations of public funds authorized for the public schools, light, heat, janitor service and such other expenses as may be necessary to enable the comfortable and convenient use of public school buildings as community forums and community centers under the provisions of this act.

General Suggestions. The only sure way to make the community center a permanent institution is to have it authorized legally. Experience has shown that a carefully-planned and well-advertised community demonstration serves to give the matter the proper publicity and emphasis, and the first step should always be the organization of the adult community forum. The forum programs will of course be determined by local conditions, but there is no community to which President Wilson's words do not apply:

What I like about this social center idea of the schoolhouse is that there is the place where the ordinary fellow is going to get his innings, going to ask his questions, going to express his

opinions, going to convince those who do not realize the vigor of America that the vigor of America pulses in the blood of every true American, and that the only place he can find the true American is in this clearing house of absolutely democratic opinion.

Questions concerning the public health, the upkeep of streets and parks, traffic conditions and a dozen other topics of local interest will be included in the discussions, and there will also be consideration of larger matters—state, national and international problems. The young people and the children of the neighborhood will find in the adult association a pattern for their own societies, and thus there will be organized the various athletic, dramatic, social, literary and educational clubs. An organization of the older youth of the community for the study and discussion of civic questions will be found an admirable means of training for citizenship. Finally, on certain evenings the various groups—children, young people and their elders—will meet together for a harmonious community gathering, a gathering of the great neighborhood family—and that community will be happiest which makes the occasion attractive for those in every walk of life. Certainly there is no better way to celebrate the special days—Hallowe'en, Thanksgiving, Christmas and the rest—than this. On such occasions there can be but one sentiment, expressed in such words as these:

Come close and let us wake the joy
  Our fathers used to know,
When to the little old schoolhouse
  Together they would go.
And neighbor's heart to neighbor warmed
  In thought for common good.
We'll strike that fine old chord again—
  A song of Neighborhood. B.M.W.

COMO, *ko'mo,* LAKE, one of the celebrated beauty spots of Northern Italy, is visited annually by many thousands of tourists and has a large permanent summer population of Europeans. About sixteen miles long and two and a half miles wide, it lies at the foot of the Alps, which rise 7,000 feet high behind the handsome villas, gardens and vineyards lining the shores. The River Adda both feeds and drains the lake, as it runs through it, and the chief towns on its shores are Como, Bellano, Cernobbio, Bellaggio and Menaggio.

COMPARISON (IN GRAMMAR). A French or a German adjective must be plural in form if the noun it modifies is plural, and must take the feminine ending to agree with a noun in the feminine gender. An English adjective, on the other hand, is inflected for one purpose only—to express a greater or a smaller quantity or degree of the quality it denotes. Such variation, which applies also to adverbs, is called *comparison.* The above statement does not include the pronominal adjectives, such as *this* and *that,* which are inflected for number.

The Three Degrees. *Positive.* When we say, "This book is heavy," or "This book is interesting," the adjectives *heavy* and *interesting* are said to be in the *positive degree.* The corresponding adverbs, *heavily* and *interestingly,* are also positive in degree.

Comparative. With two books before us, we may say, "This book is heavier than the other," or "more interesting than the other," and in the descending scale, "less heavy" or "less interesting, than the other." *Heavier, less heavy, more interesting* and *less interesting,* with the related adverbial forms *more heavily, less interestingly* and the like, are said to be in the *comparative degree.*

Superlative. Among three or more books, we may point out the one which has the highest or lowest degree of weight or interest, saying, "This is the heaviest (or least heavy) book"; "This is the most interesting (or least interesting) book." *Heaviest, least heavy, most interesting, least interesting,* and their corresponding adverbial forms *least heavily, most interestingly* and the like, are said to be in the *superlative degree.*

Where the suffixes *er* and *est* are added to the positive form it is called *comparison by endings,* and where the adverbs *more, most, less* or *least* are prefixed it is called *comparison by adverbs.* See ADJECTIVE; ADVERB.

Irregularly-Compared Adjectives. Some of the commonest adjectives are irregularly compared—words that have come down from Old English forms. The following list includes a few which, though not now in familiar use, are frequently met with in writing that employs the quaint English of an earlier day. As indicated, some have no positive form as adjectives.

POSITIVE	COMPARATIVE	SUPERLATIVE
aft, *adv.*	after	aftmost, aftermost
bad, ill, evil	worse	worst
far	farther	farthest
forth, *adv.*	further	furthest
good, well	better	best
hind	hinder	hindmost, hindermost
in, *adv.*	inner	inmost, innermost
little	less	least
much, many	more	most
near	nearer	nearest, next
nigh	nigher	nighest, next
old	older, elder	oldest, eldest

Adjectives and Adverbs without Comparison. There are many adjectives and adverbs whose meaning is such that it is clearly impossible to compare them without violating the laws of logic; among these are words like *perpendicular, square, eternal, unique, absolutely,* for instance. If a pole is perpendicular we could not make it more perpendicular. However, with two poles set up, neither of which is truly perpendicular, we may speak of one as more perpendicular than the other, in the sense that it is more nearly perpendicular.

Among the adjectives that, strictly speaking, have no shades of meaning and therefore do not admit of comparison through the use of *more, most, so, too, very,* and similar adverbs, may be mentioned the following:

absolute	incurable
annual, daily	infallible
cloudless	infinite
conclusive	lawful
continual	omnipotent
dead, living	perpetual
empty, void, full	right, correct, true
eternal	solid
perfect	square, circular, round
fundamental	triangular
human	unanimous
immaculate, spotless	unique
impossible	universal
inaudible	wrong

Uses of the Superlative. The superlative degree has a wider application than the comparative. It is often employed in the sense of *very,* without implying comparison at all; "His success was *most brilliant*"; "She wore the *queerest clothes.*"

In every-day speech it is common to hear the superlative adjective or adverb used where only two things are compared; as, "Helen is the *prettiest* of the twins." This is incorrect, the proper expression being, "Helen is the *prettier* of the twins."

"Other" and "Else." Before we can use an adjective in the comparative degree, we must have two distinct objects or groups. To compare Robert's height with that of the other boys in his class, we must stand Robert by himself and set the other boys off in a group, to avoid comparing Robert with himself. Then, in expressing the result of such comparison, we must bring out this idea of *separation* by using some separating word like *other* or *else;* as "Robert is taller than any other boy in his class," not "Robert is taller than *any* boy in his class"; or "Robert is taller than *anybody else* in his class," not, "Robert is taller than *anybody* in his class." If the sentence fails to set Robert apart from the others, it fails to give the two distinct elements that are demanded by the comparative degree.

On a first visit to a great city a boy or girl should not write, "This city is larger than *any* I have ever seen," but "This city is larger than *any other* I have ever seen."

Common Errors. Many of the errors that appear in the comparison of adjectives and adverbs have been referred to in the sentences that have been given to illustrate the various rules. The following list reëmphasizes some of these pitfalls and calls attention to one or two new points:

Brazil produces more coffee than any country in the world, for *Brazil produces more coffee than any other country in the world.* Since Brazil is included in the phrase "any country in the world," the separating word *other* is needed to make comparison possible.

Of all other people, I like him the least, for *Of all people I like him the least.* The superlative *includes* the object of the comparison; therefore an excluding word like *other* is out of place.

No metal is so valuable in science as radium, for *No other metal is so valuable in science as radium.* Since radium is one of the metals, it must be excluded from the other term of the comparison.

A more happier couple you never saw, for *A happier* (or *more happy*) *couple you never saw.* Double comparatives are as grievous an error in grammar as double negatives.

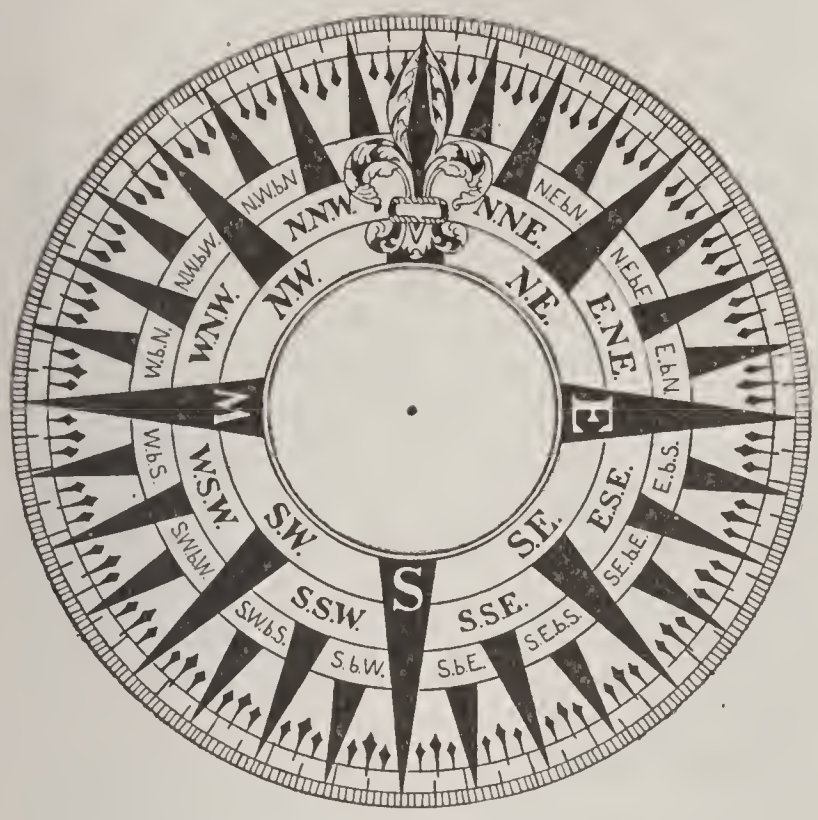
Which is more preferable in your opinion? for *Which is preferable in your opinion? Preferable* being in itself a comparative, the prefixing of the adverb *more* produces a double comparative.

This was the most unkindest cut of all, for *This was the unkindest* (or *most unkind*) *cut of all.* This line from *Julius Caesar* involved no error in Shakespeare's time, but the grammar of the present day classes a double superlative as an impropriety. L.M.B.

COMPASS, an instrument which in its simplest form consists of a magnetic needle mounted on a pivot, always pointing in the direction of the magnetic north and south poles. Such compasses, very small in size, are often worn as ornaments on watch chains or carried in the pocket by travelers.

On board ship the most important instrument in use is the *mariner's compass,* a more complicated and accurate instrument; without it ocean navigation would be in the highest degree dangerous, if not impossible. It consists of a series of magnetic needles supporting a card, known as the compass card, which is mounted on a pivot of steel. The *cardinal points,* north, south, east and west are plainly indicated on the card, which is further divided into the *intercardinal* points, northeast, north-

west, southeast and southwest. The degrees are marked from zero to 360, starting at the north and going round the card in the same way that the hands of a clock move. The combination of card and needles is enclosed in a brass box and it is so pivoted that no matter



FACE OF MARINER'S COMPASS

how much the ship may change its position, the compass card always remains horizontal. As an aid to navigation, the degrees are further divided into points, half points, quarter points and in some cases even eighth points. If required to steer in a northeasterly direction the steersman by use of the rudder brings the bow of the ship into a direct line with the point marked N. E. on the compass card and the center of the wheel.

Deviation of the Compass. This term indicates error in direction or pointing of the compass, caused by the magnetism of the ship on which it is placed. Such deviation does not occur to any appreciable extent in wooden ships, unless the cargo contains a large amount of iron. In vessels built of iron, however, the deviation is sufficient to cause a decided error in direction of steering. Some compasses are so delicately adjusted and so sensitive that metal in the pocket of a steersman has been known to cause an appreciable deviation. Compasses used in iron vessels are carefully corrected, and the deviation is noted on charts so that the navigator can readily calculate the exact direction in which the ship is headed. Sometimes the error or deviation is so slight that mechanical correction of the compass is not necessary. In other cases, however, it is essential that the deviation be counteracted by placing bars of magnetic steel beneath it in such a manner as to cause the compass, when stationary, to point directly towards the magnetic pole. Deviations are also caused by the natural attraction of the earth. The power of such attraction varies in different latitudes. For the benefit of navigators, charts are provided which indicate the natural deviation to be expected in all latitudes.

Boxing the Compass, a term applied to ability to repeat the names of all the points, half points, quarter points and eighth points of the compass, in their proper order. This is an accomplishment required of sailors, especially those called upon to steer vessels. The origin of the term is not known, but it is probably due to the fact that the compass on board ship is contained in a brass box.

Surveyor's Compass. This form of compass, used only on land, consists of a magnetic needle moving over a disk on which, in addition to cardinal and intercardinal points, degrees, minutes and seconds are marked. The method of use is exactly similar to that on board ship, except that the surveyor's compass is fitted with a system of levels and screws by which its position is ascertained and regulated so that it may remain perfectly horizontal while in use. F.ST.A.

COMPOS'ITE FAMILY, or **COMPOSITAE,** *kom poz'i tee,* the largest family of flowering

SOME MEMBERS OF THE COMPOSITE FAMILY

(*a*) Goldenrod
(*b*) Cosmos
(*c*) Dahlia
(*d*) Sunflower
(*e*) Dandelion

plants, containing over 12,000 known species—one-tenth of the species of flowering plants in the world. They consist of herbs or shrubs

and are distributed all over the world. The characteristic of the family, which gave it the name, is the head of small flowers, which early botanists thought to be a single compound flower. In reality, however, the flower-heads of this family of plants are closely-clustered groups of small flowers, either ray or tubular, or both. In many species the flowers in the outer margin of the head are different in form from the others, being conspicuous ray flowers, the inner or disk flowers being tubular and less conspicuous.

Having so many flowers bunched together in one head, *compositae* have a perfect arrangement to make sure of pollination and fertilization, and so they are ranked as the highest seed plants. Many plants of this family have clever means of seed distribution; among such are thistles, dandelions, etc., which have seeds that float away on the winds, and the burdock, whose seeds are carried away on the fur of animals. A great many plants of this large family are cultivated for ornament only, and some few serve as food plants. Others have considerable medicinal value. Many compositae are described in this work under their individual titles.

Related Subjects. Reference is directed to descriptions of the following members of this flower family in these volumes, and to other kindred topics:

Arnica	Lettuce
Aster	Seed Dispersal (subtitle under Seeds)
Botany	Sunflower
Chrysanthemum	Tansy
Dahlia	Thistle
Goldenrod	

COMPOSITION, *kom po zish' un,* **OF FORCES.** If two boys stationed at *a* in the accompanying diagram kick a football at the same instant, one with a force that would drive it to *b* and the other with a force that would drive it to *c,* the ball will move to *d.* That is, the result will be the same as it would have been had the first boy driven the ball to *c,* then the second driven it to *d.* The forces *ab* and *ac,* therefore, combined to move the ball along the path to *d.* Such a combination is known as the *composition of forces,* and the path over which the body acted upon moves is called the *resultant;* in the illustration *ad* is the resultant.

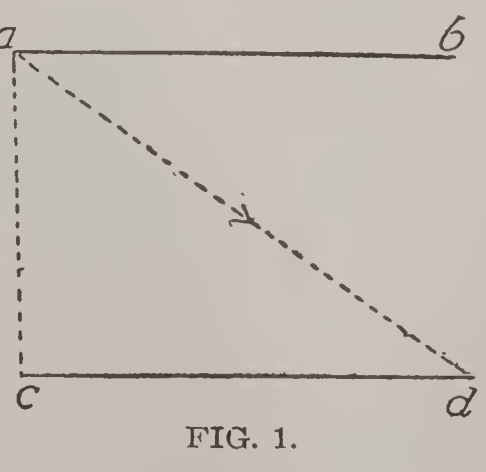


FIG. 1.

Illustrations of this law of forces are common. The principle is frequently employed for supporting objects in a given position. In the second figure is a street lamp; *ab* and *cb* are wires extending from standards on the opposite sides of the street, attached to lamp at *b.* Three forces are acting upon the lamp; these are gravity, which pulls it down, and *ab* and *cb,* which pull it towards the standards to which they are respectively attached. These forces are brought into equilibrium when the lamp is at *l.* The resultant for any number of forces acting upon a body may be found by finding it for any two, then for this resultant and a third force, and so on.

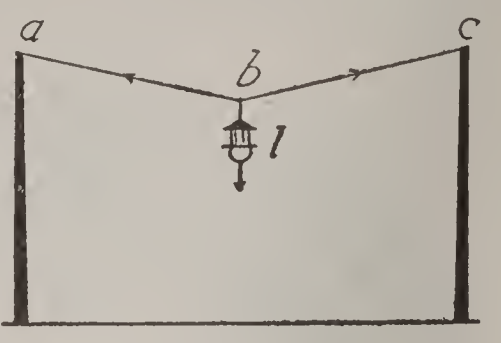


FIG. 2.

COMPRESSED, *kom prest',* **AIR.** The pop gun and air rifle are the simplest illustrations of devices for using compressed air. They operate on the principle that air can be compressed and that when pressure is removed it will expand. When the plunger is forced into the barrel of a pop gun the air is compressed until the pressure is strong enough to force out the pellet. The air expands with force as soon as the pellet begins to move, and it throws it from the barrel with a force that sends it several feet. The air rifle is practically a pop gun on a more elaborate scale.

How Air Is Compressed. The machinery necessary for compressing air includes a closed vessel called the *receiver,* in which the air can be confined, and a pump for forcing the air in (see AIR COMPRESSOR, for illustration). The receiver is usually made of steel plates riveted together, the same as in a steel boiler. Great strength is required, since the pressure for ordinary purposes may be as high as 300 pounds to the square inch. For special purposes it may reach 3,000 pounds to the square inch, but where such high pressures are required, special receivers must be constructed.

A rise in temperature always accompanies compression, and the heat generated is often a serious obstacle. Engineers have invented various devices for cooling compressed air, but none is entirely satisfactory. The most common device is that of running cold water through a jacket around the pump cylinder.

When the air expands it cools very rapidly, and unless means are provided for preventing the lowering of temperature the machines operated by compressed air soon become covered with frost and ice. To avoid this the compressed air is usually passed through a warming chamber before being admitted to the machine.

Uses. Compressed air is used for so many purposes that to name them all would be impracticable. One of the most common uses is for the operation of pneumatic tools (which see), such as drills, riveting machines and the various tools employed in engraving stone. The air brake system on trains is operated by compressed air (see AIR BRAKE). A machine for shearing sheep is operated by compressed air, another device rings the bell on locomotives, and another is used in foundries for tamping the sand in large molds.

Compressed air locomotives are employed in mines for hauling cars and also in tunneling operations. There is no risk from fire in their use, and they do not give off poisonous gases. In some countries of Europe street cars are operated to a limited extent by compressed air, but its use on street cars in America is confined to a few so-called "owl" cars—cars that run after midnight, when for economical reasons the electric power used during the day is shut off.

Compressed air is sometimes used by physicians for expanding the lungs beyond their natural capacity. In such uses the pressure is a little higher than that of the atmosphere in its natural state, which is about fifteen pounds to the square inch. W.F.R.

COMPROMISE, *kom'pro mize,* **OF 1850,** a series of measures passed in August, 1850, in the Congress of the United States, their purpose being to allay the strife between the pro-slavery and anti-slavery factions, by granting concessions to both parties. It contained the propositions (1) that Texas be paid $10,000,000 to relinquish its claims on New Mexico; (2) that California be admitted as a free state; (3) that the remaining territory obtained from Mexico be organized into the territories of New Mexico (then including Arizona) and Utah, without reference to slavery; (4) that the slave trade be abolished in the District of Columbia and (5) that the South be granted an efficient fugitive slave law. The legislation helped to postpone the War of Secession for a decade. These measures were passed largely through the efforts of Daniel Webster, Henry Clay and John C. Calhoun. See GUADALUPE HIDALGO, TREATY OF; FUGITIVE SLAVE LAWS; KANSAS-NEBRASKA BILL.

COMPUL'SORY EDUCATION. See EDUCATION, subtitle *Compulsory Education.*

COMTE, *koNt,* ISIDORE AUGUSTE MARIE FRANÇOIS XAVIER (1798-1857), a French philosopher who founded the system known as *positivism.* The central idea of this philosophy is that the only real knowledge that man can have is the knowledge of things about him. The disciples of Comte think of him as the founder of a new religion, the religion of humanity, for he taught that all should worship humanity, the "Great Being" of which each one is a part.

The founder of positivism was born in Montpellier, where he received his early schooling. At the age of sixteen he entered the polytechnique school of Paris and two years later began to earn his living by teaching mathematics. At this time he was an enthusiastic admirer of the life of Benjamin Franklin, and, in imitation of the late American philosopher, "formed the design of becoming perfectly wise." In 1818 he came under the influence of the socialist Saint Simon, who suggested to him the basic ideas on which his own system rests. Twice during his life he had attacks of insanity.

Comte's theories were well worked out by 1826, when he began to advance them in a course of lectures, but overwork caused his health to break. After recovery he began to put his philosophic system into permanent form, and in 1830 published the first volume of his *Course of Positive Philosophy,* the last and sixth volume appearing in 1842. This work was really an introduction to his *System of Positive Polity,* published between 1851 and 1854. Comte held a position in the polytechnique school between 1836 and 1846, but after 1848 he lived on a fund raised by public subscription.

The key to the philosophy of positivism is what Comte called the Law of Three States—that men's thoughts show three stages of development. In the first period, the *theological* stage, they believe that divine beings produce all phenomena; in the second, the *metaphysical* stage, they believe that abstract forces, either mental or physical, are the cause of all activity; in the third, the *positive* stage, they cease to inquire into the causes of phenomena and confine themselves to things about which they have actual knowledge. B.M.W.

CONCEPT, *kon'sept.* A concept is one's idea of a class of objects, expressed by common nouns without modifiers, as *cat, horse, house.* If I say *the cat,* I usually refer to one particular cat. If I say *a cat,* I mean *one* cat, but not any particular cat, while the word *cat,* without any limitation, means *all* cats. For this reason a concept is called a *class,* or *general, idea,* or *notion.*

Concepts are formed by the child as a result of direct observation. That is, he arrives at the general idea *cat* by the observation of many cats. His first idea of cats is that of his own pet kitten and includes size and color. Repeated observations stamp the picture of the kitten on his memory. When he sees another cat of different size and color he may at first think it to be some other animal, but he soon learns that it also is a cat. He then reconstructs his idea and omits from it those qualities not common to both cats, such as size and color. One cat may be black and the other white; one may be small and the other large, but both have round heads, pointed ears, a long body, four legs and a tail. The child soon learns that all cats have these characteristics, and he blends them all into his general idea (concept) *cat.* All concepts are formed by a similar process.

The formation of concepts is an essential step in mental development. Since all concepts are formed from ideas of individual objects gained through observation, their accuracy depends upon the accuracy of one's observations. Teachers and parents should therefore help children to observe objects carefully and accurately. Clear concepts are essential to clear thinking.

CONCERTINA, *kon sur te'nah,* an improved form of accordion. Usually six-sided, this instrument is composed of a bellows with two ends on which the stops or studs are placed. It is held between the hands so that the fingers fall naturally on these studs, and the performer so operates the valves that air is admitted to the metallic reeds, and sounds are produced. As there are two tongues or reeds for each tone, sound may be produced by pulling the bellows open or pressing them together. Including chromatic tones, the range of the instrument is from the lowest violin G to the C three and one-half octaves higher. Concertina music is artistic and beautiful when played by a skilled performer.

CONCH, *konk,* from a Greek word meaning *shell,* or *shell-like,* is applied to a large and useful mollusk of tropical waters, found abundantly in the West Indies and on the coast of Florida. It has a heavy spiral shell, which is used for many purposes. Shiploads of the lat-

CONCH SHELL

ter are sent to various parts of the United States and Europe to be ground up for porcelain making, to be burned into lime or to be used as ornaments. Many of them, with the end broken off, are used as dinner horns on Southern plantations. From some conchs inferior cameos are cut (see Cameo). The pink Bahama conchs furnish the valuable "conch pearls." Others are used in button making, and in the East Indies the shell of one species is used as a musical instrument. The animal itself is sometimes eaten, and the poorer people of Southern Florida and near-by islands once used them for food and collected them for sale. The egg cases of these mollusks look like leathery circles strung upon a cord, and have been called "sea necklaces."

CONCLAVE, *kon'klave,* an assembly of people meeting privately. Originally the word related solely to the assembly and place of meeting of cardinals of the Roman Catholic Church for the election of the Pope. The word in French or Latin means a *room which may be locked.* Long ago Popes were chosen by the clergy and the people, but elections frequently were attended by confusion. In the Council of Lyons in 1274 the present method was developed. Ten days after the death of a Pope, the cardinals meet in the city in which he died. A large hall is divided into small rooms, three of which are given to those of princely rank, two to each of the ordinary cardinals. The first day the meeting place may be viewed by the public, but thereafter the cardinals are locked in and allowed no communication with the outer world until after the election. Their food is prepared in the same building, but formerly it was passed

through a window and thoroughly examined, that no letters might reach the cardinals.

The conclave in Rome in July, 1903, the first in which a United States cardinal participated, resulting in the election of Pius X, lasted but five days; in 1914 Benedict XV was chosen as his successor in four days, the shortest conclave on record. Some conclaves in the past have lasted for months. See POPE; CARDINAL.

CONCORD, *kong'kerd,* MASS., a town in Middlesex County, of special interest as the former home of such distinguished Americans as Thoreau, Emerson, Hawthorne, William Ellery Channing and Louisa M. Alcott. In beautiful Sleepy Hollow Cemetery are the graves of Thoreau, Emerson and Hawthorne. Orchard House, the home of the Alcott family, is preserved as a memorial of the author of *Little Women,* and contains many interesting relics. Concord is twenty miles northwest of Boston, and lies on the Concord and the Sudbury rivers. It is served by the Boston & Maine Railroad and by interurban lines. The chief industrial enterprises of the town are its manufactories of rubber goods, chains, woolens and harness. Concord was settled in 1635 and is the oldest town in the interior of Massachusetts. It was a storm center of the pre-Revolutionary agitation; the attempt of the British to seize a supply of ammunition stored there, in April, 1775, precipitated the memorable Battle of Lexington and Concord (see LEXINGTON, BATTLE OF). One of the notable features of the place is a sculptured figure called *The Minute Man,* the work of Daniel C. French, who at one time had his studio in Concord. Population in 1920, 6,461.

CONCORD, N. C., a cotton-manufacturing town in the southwestern part of the state. It is on the Southern Railroad, twenty-one miles northeast of Charlotte and 150 miles west and south of Raleigh, the state capital. The area of the city is about four square miles. The population in 1910 was 8,715; in 1920, 9,903. In the cotton mills of Concord, which number more than twenty, over 100,000 bales of cotton are annually manufactured into cloth, sheeting, etc. The pay roll of these mills exceeds $1,500,000 a year. Foundries, bleacheries, iron works, roller mills, wood-working plants, an oil mill and machine shops are other important industrial establishments.

The Jackson Training School, maintained by the state for wayward boys, is in Concord; there is also the Scotia Seminary, a school for colored girls, the largest of its kind, supported by the Presbyterian Board of Missions for Freedom. The prominent public buildings are the Federal building, library, city hall, opera house, courthouse and hospital.

The town was incorporated in 1793 and is now governed under a charter granted in 1851, but revised in 1891. G.E.K.

CONCORD, N. H., the state capital and county seat of Merrimack County, in the south-central part of the state. The city extends for two miles along both banks of the Merrimac River, and is connected with Boston by the Middlesex Canal, completed in 1814. It is seventy-three miles northwest of Boston and eighteen miles north of Manchester, on the Boston & Maine Railroad. The population in 1910 was 21,497; in 1920 it was 22,167.

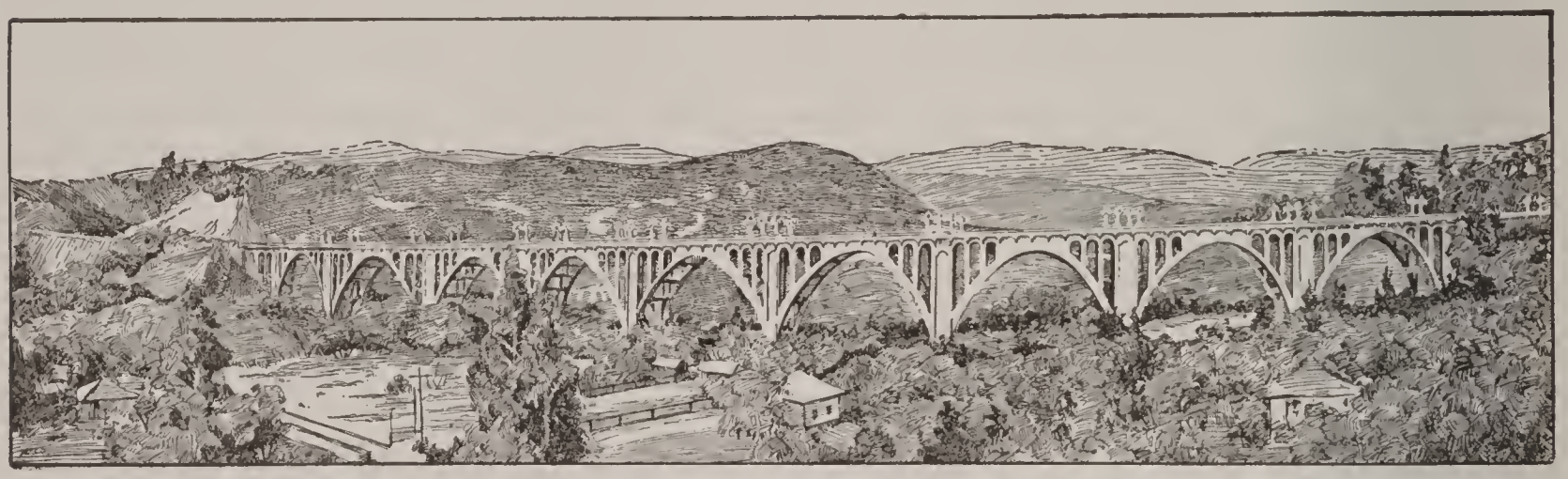
Concord is a city of notably wide, well-shaded streets, and has five attractive parks—White, Penacook, Rollins, Contoocook River and Fiske. The prominent public buildings include the state capitol (built of native white granite), the state library, New Hampshire Historical Society building, city hall, county courthouse, post office, home for the aged, the Fowler public library, a state hospital and state prison, the Margaret Pillsbury Memorial Hospital, and the Rolfe and Rumford Asylum for Orphan Girls. Among a number of fine churches is the Christian Science Church, built by Mrs. Eddy. Structures of historical interest are a soldiers' memorial arch, statues of Daniel Webster, John P. Hale, John Stark and Commodore George H. Perkins. The last was created by Daniel C. French. Concord is the seat of two important schools, Saint Paul's for boys and Saint Mary's for girls.

A great amount of stone is quarried and shipped from extensive beds of fine-grained white granite near the city. This is the leading industry. The manufactures include silverware, harness, carriages and wagons, cotton and woolen goods, furniture, flour, machines, electrical appliances and pianos. The railroad shops of the Boston & Maine Railroad are located at Concord.

In 1660, a trading post was established at Penacook, the chief village of the Penacook Indians and the present site of Concord. In 1725 Concord was founded. Owing to boundary disputes between Massachusetts and New Hampshire, that there might not be two Concords, the town was incorporated as Rumford, in 1733. During the Indian wars it was the victim of many depredations, and in 1746 suffered a great massacre. The name was

changed to the "Parish of Concord" in 1765, and the town was incorporated in 1784. In 1808 it became the state capital, and was incorporated as a city in 1853. W.W.T.

CONCORDAT, *kon kawr' dat,* in the affairs of the Roman Catholic Church an agreement between the Pope and a secular government for the settlement and regulation of affairs of the Roman Church within that state. It may be proclaimed in the form of a Papal bull, or edict, or it may be by formal treaty. There have been many famous concordats in history, but as the principle of the separation of Church and State has gained ground such instruments have become of less importance; the denunciation of a concordat by a nation does not necessarily entail the separation of Church and State in that country, or the rupture of diplomatic relations with Rome. See TREATY.



A CONCRETE VIADUCT

This structure connects Pasadena, Cal., with San Raphael Heights. It is 1,476 feet in length, and the highest span is 148 feet above the valley below. The cost was nearly $250,000, and it was a year and a half in building.

CONCRETE, *kon kreet',* an artificial stone which is now being largely employed for a great variety of building purposes, from tall business blocks and mammoth factories to fine residences and to bridges and culverts. It is made by mixing sand, Portland cement and gravel, crushed stone or cinders and adding sufficient water to wet each particle. For some purposes enough water is added to reduce the compound to the consistency of mortar, but if the mixture is too wet the heavier particles will sink and the lighter ones rise to the surface, giving uneven strength to the concrete. The cement binds the other materials together in hardening and forms them into a strong, durable stone. The proportions most generally used, especially for what is known as *reinforced concrete,* are—

1 part cement
2 parts sand
4 parts gravel or crushed stone

Another combination also recommended is—

1 part cement
3 parts sand
6 parts gravel or crushed stone.

The former mixture is suitable for reinforced concrete, the latter for ordinary work. The amount of water varies from about one-sixth to one-fourth the volume of the mixture; that is, four gallons of dry mixture would require about one gallon of water. The strongest concrete is that in which each particle of sand is surrounded by cement and all the space between the pieces of stone filled with cement and sand.

Concrete is of a grayish color. When a smooth finish is desired it is covered with a mortar of one part cement and two parts sand. Concrete hardens or "sets" in a few hours, but does not reach its full strength until about two years after it is laid. After this time it retains its durability and hardness, and for most purposes it is more lasting than natural stone. The strength and durability depend upon the quality of the materials used and the care with which they are mixed. Crushed stone makes a stronger concrete than gravel, because the cement, owing to its flat, unpolished surfaces, can bind it more firmly. A poor grade of cement or dirty sand makes a weak concrete, and the best material, when poorly mixed, makes an unsatisfactory product. Concrete should never be made in cold weather.

Concrete Construction. Concrete is so easily adapted to all sorts of building purposes that within the last few years its use has been widely extended. The farmer can have concrete foundations for his buildings, concrete graneries, which are fire and vermin proof, and concrete fence posts, if he desires them.

Engineers are now using concrete for the

piers, abutments and superstructure of bridges, for dams and for lining tunnels. Architects are employing it for dwellings and apartment houses, factories, office buildings, stores and various other structures. It can be run into molds for making ornamental work, made into blocks for the construction of dwelling houses, and built into solid walls for large buildings, grain elevators, bridges, dams, foundations and fortification walls. The fortifications of New York harbor and the foundations for the great guns behind them are of concrete, and the locks of the Panama Canal are of this same material. In 1916 an ocean-going vessel made of concrete was launched in Sweden.

Reinforced Concrete. Concrete can resist great pressure, but pulls apart very easily. In the article BRIDGE will be found an illustration showing that a beam may break by pulling apart on the under side. For this reason steel rods are anchored in walls and floors of a concrete building before the concrete is poured into the molds; the rods are thus buried in the concrete and prevent pulling apart. For strengthening floors two sets of rods are used, those of one set crossing those of the other at right angles. The rods are secured to the walls and usually fastened together with wires at the points of intersection. In the construction of pillars a sort of frame consisting of vertical rods and hoops is used. The steel work is put in place and the concrete is poured around it. When the cement hardens a firm, strong structure is the result.

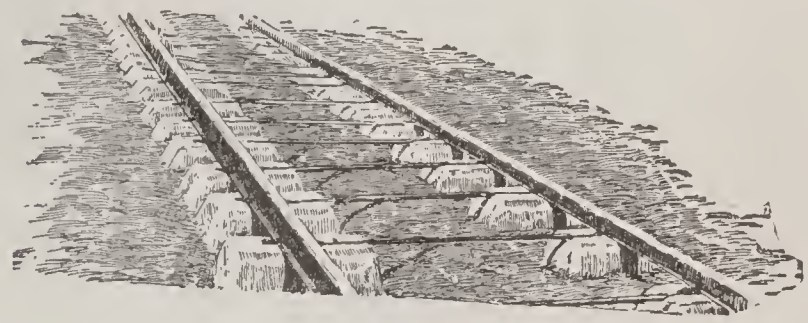
Concrete Blocks. Concrete blocks are made in molds and are hollow. They are used for the walls of dwellings, for which they form a very desirable material. Being hollow, they contain a dead-air space, which protects the interior from frost. The houses of Morgan Park, near Duluth, Minn., a village built by the United States Steel Corporation for their employees, are constructed entirely of concrete blocks.

Mixing the Concrete. For small structures the mixing may be done by hand, the workmen using shovels, but for most work mixing machines are employed. The best of these machines receive the raw material at one end, and deliver the prepared concrete at the other. Machines of the latest pattern use compressed air for mixing.

Completing the Structure. Molds for holding the semi-fluid concrete are first put in place. They may be of wood or steel, but must be so constructed that they can be removed easily when the concrete has set. The concrete is taken from the mixer in wheelbarrows, carts, cars drawn by locomotives, elevators or other devices, and carefully poured into the molds. Since the cement begins to change as soon as it is wet, the concrete must be put in place as fast as it is mixed. In the construction of high buildings an endless belt to which buckets are attached is used for carrying the concrete to the upper stories. The floors in such buildings are supported on temporary wooden floors which are held in place by studding until the concrete has hardened.

Concrete Roads. Concrete forms one of the most desirable materials for surfacing streets and country roads. It is laid on a firm foundation of sand or gravel and allowed to dry slowly, so that it becomes very hard. When surfaced with a coat of asphalt it makes an ideal street. See CEMENT; ROADS AND ROAD BUILDING, for comparative cost of various kinds of paving material.

How to Build a Concrete Foundation. To build a concrete foundation for the small house described in the article CARPENTRY, excavate a trench to a line below the depth to which frost penetrates. The trench must be enough



A NEW USE FOR CONCRETE
Concrete ties for railroads are cheaper and more durable than wooden ties.

wider than the wall itself for the work to be easily done. With strong planks, across which are nailed upright 2 x 4's every two feet, make a wall for each side of the mold. Set the two walls in place in the trench with the smooth sides inward. As the concrete when poured in will tend to thrust the forms apart, they should be tied together at intervals of a few feet with pieces of wood or with wire. Two wires set close together can be tightened the proper amount by inserting a stick between them and twisting. The forms should also be strengthened from the outside by diagonal braces nailed to stakes driven in the ground. Mix the sand, cement and stone in small quantities upon a mixing board about six feet square, adding the water a pailful at a time. Put the concrete in the molds as fast as it is mixed.

Estimating. Sand and stone are bought by the cubic yard, cement in sacks of 100 pounds containing slightly less than a cubic foot. After water is added the three elements will shrink to about eighty per cent of their original volume. Multiply the distance around the house in feet by the height and again by the thickness of the foundation in feet, then divide the result by twenty-seven to get the number of cubic yards. One cubic yard of sand, two cubic yards of stone and ten sacks of cement will make about two and two-thirds cubic yards of concrete. C.H.H.

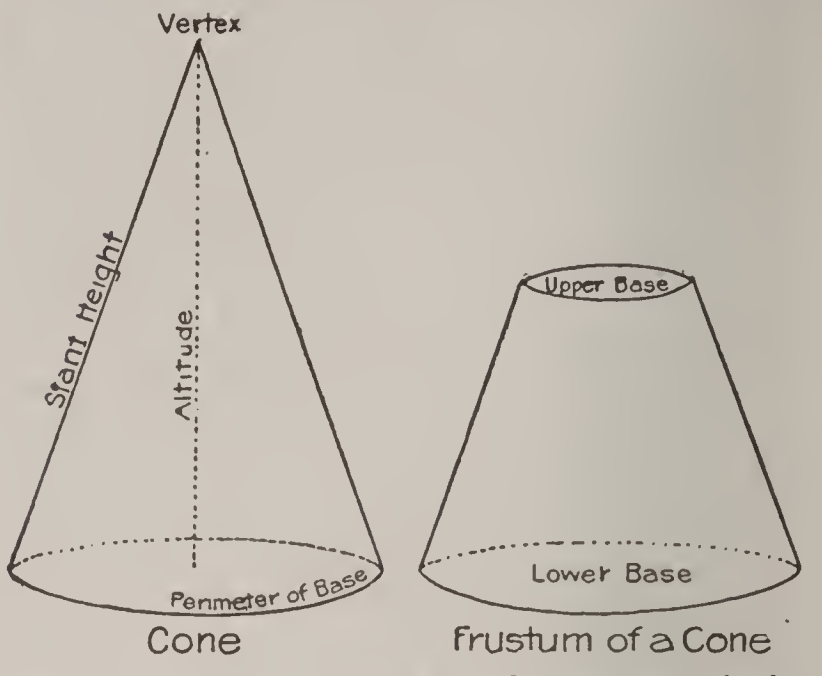
For further illustrations of concrete structures, see BRIDGE. Consult Hood's *Reinforced Concrete Construction;* Taylor and Thompson's *Concrete, Plain and Reinforced.* A journal devoted to concrete is *Concrete and Cement Age.*

CON'DOR, the largest known creature of the air, a bird of prey, keen of sight and smell, wonderfully graceful in flight, but with habits disgusting and cowardly. The native home of the condor is the South American Andes, but in the mountains on the Pacific coast of the United States there was once one larger than all the others. Its expanse of wing was more than the usual ten feet of the South American species, and it was longer than fifty inches. Like the South American condor it was black, with white tinged wings, but it was without the downy ruff of white feathers. Instead, it had a fringe of black feathers on the back of the neck, which made it look very savage. The condor's head and neck are covered with dull red skin, folded in great wrinkles. The male has a comb and wattles of red skin.

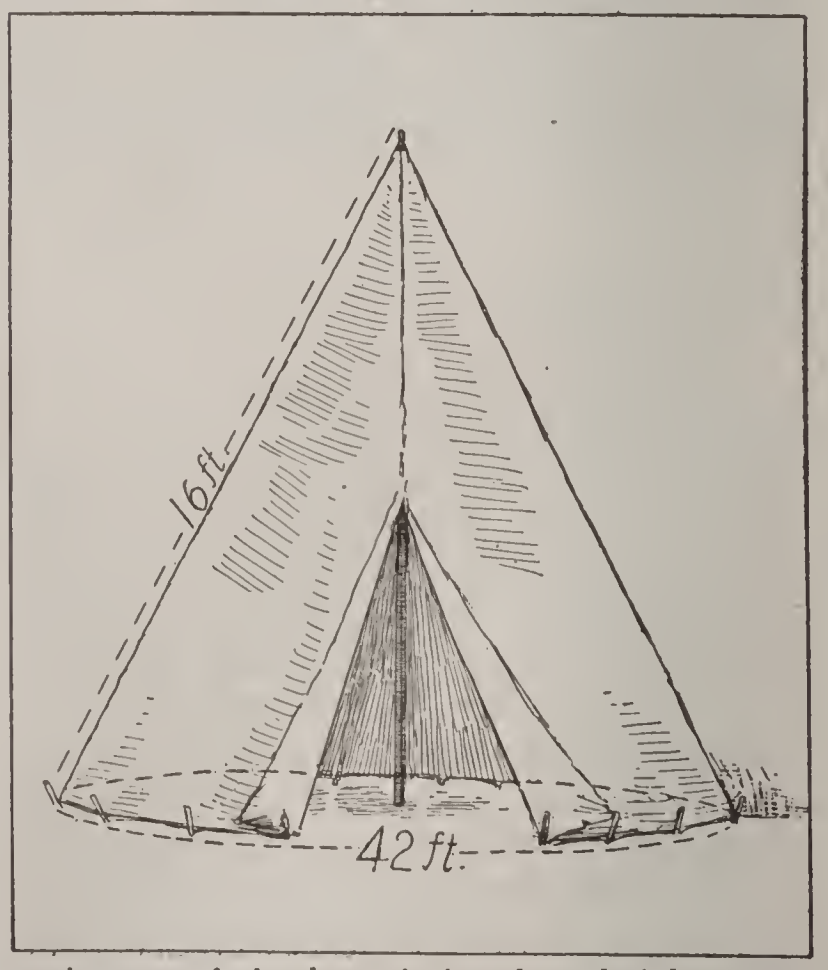
THE CONDOR

Condors nest among the rocks of high cliffs. They come down to feed on dead animals and decaying flesh, but they also attack sick or helpless animals which are unable to defend themselves, and they gorge themselves to such an extent that they become helpless and can be lassoed while feeding. The condor lays two white eggs in a high cliff nest of a few sticks. In the larger museums, condor eggs have brought as high as $100 each.

CONE, *kohn,* a solid whose base is a circle, and whose convex (outward-curving) surface tapers uniformly to a point called the *vertex.* The cone generally used in practical problems is the *right circular cone,* in which the line



drawn from the vertex to the center of the base is perpendicular to the base. The perpendicular distance from the vertex to the center of the base is called the *altitude* of the cone; the distance from the vertex to the



perimeter of the base is its *slant height.* The *frustum* of a cone is the portion left after the top is cut off on a plane parallel to the base.

Rules and Problems. (1) The volume of a cone is equal to one-third the volume of a cylinder which has its base equal to the base of the cone, and its altitude equal to the altitude of the cone. This can be observed from the following experiments:

(a) Make a cone and a cylinder, of equal base and altitude, of strong paper. Fill the cone with salt, sand or sugar. Empty its contents into the cylinder. Continue this until the cylinder is filled. How many times did you empty the cone of sand into the cylinder to fill the latter? (Three times.)

(b) Fill the cone with sand; fill the cylinder with sand. Weigh them. How do their weights compare? (1 to 3.)

(2) The volume of a cone equals one-third the product of the base and altitude.

(a) If the altitude of a tent is 14 feet and the area of the ground space is 153.9384 square feet, how many cubic feet of air would it contain?

(3) The area of the lateral surface (all of the surface but the base) equals the circumference of the base multiplied by one-half the slant height.

(a) John and Harry made a tent. The ground space which it covered had a circumference of 42 feet, and the slant height was 16 feet. How many square feet of canvas did they use?

(4) To find the volume of the frustum of a cone, multiply one-third of the altitude by the sum of the areas of the two bases plus the square root of their product.

(a) How many gallons of water are there in a tank having the shape of a frustum of a cone, whose altitude is 6 feet and whose top and bottom are respectively 20¼ square feet and 27.04 square feet in area? Use 231 cubic inches to the gallon.

The problem last given suggests the practical value of the mathematics of a cone. Given a vessel in the form of a cone or frustum, its contents in gallons or bushels may be determined by dividing the number of cubic inches in its contents by the number of cubic inches in one gallon or bushel. See GALLON; BUSHEL.

CONE-BEARING TREES, or **CONIFERAE,** *ko nif' er ee,* a commercially-valuable family of trees and shrubs found in all temperate regions, and occasionally at high altitudes in the tropics. This family includes the familiar pines, firs, hemlocks, cypresses, cedars, spruces, redwoods, larches and junipers. The cone-shaped fruit, with its heavy scales protecting the seeds, suggested the name, although not all cone-bearers *(coniferae)* bear cones. Some, like the juniper, form berries. Another characteristic peculiar to most of this pine family is the slender, needlelike leaves, close-packed and firm and so constructed as to endure cold. Therefore, bearing leaves throughout the winter, these trees have also earned the name *evergreen,* although to this condition there are a few exceptions. The tamarack sheds its leaves each season.

In forests, the scaly, fibrous trunks of cone-bearing trees are bare a great distance up, and then, as in all *coniferae,* the branches grow out horizontally and diminish in length toward the top, giving a conelike appearance to the whole tree. Thus valuable poles and masts are obtained from forests of cone-bearing trees.

VARIATIONS IN CONES AMONG THE CONE-BEARERS

The wind plays an important part in the life of cone-bearing trees. It carries the abundant supplies of light, powdery pollen from tree to tree to effect fertilization, and it bears the winged seeds to new environments. Some species are widely scattered; others, like the redwoods of California, are found only in certain localities. In some species the seeds are long in ripening, and the scales cling firmly together until the seeds are ready for their journey.

Commercial Value. Besides furnishing the most valuable timber trees, the coniferae also produce vast quantities of resin, pitch, turpentine and tar, and the products of some are medicinal. In the lumbering industry the cone-bearers have ever held first place, owing to the lightness and durability of the wood, the

ease with which it can be worked, and also to the very many uses to which the lumber can be put. The extent of the lumber industry is best told in articles bearing upon each particular species, and to these the reader is referred.

Related Subjects. Readers are referred to the following articles in these volumes; they admirably supplement the above:

Cypress	Pine
Fir	Seeds, subtitle *Seed Dispersal*
Hemlock	Sequoia
Larch	Spruce
Lumber	

CONESTOGA, *kon es to' gah.* When the white men first reached the head of Chesapeake Bay they found there a tribe of Indians, the Conestoga, who were taller and better-built than any of the neighboring tribes. They were strong and warlike, too, but were unable to hold out against the Iroquois, by whom they were defeated in 1675. They sought new homes, but were not allowed to remain in peace, and were in time reduced to a pitiable remnant. The survivors were massacred by a mob in 1763.

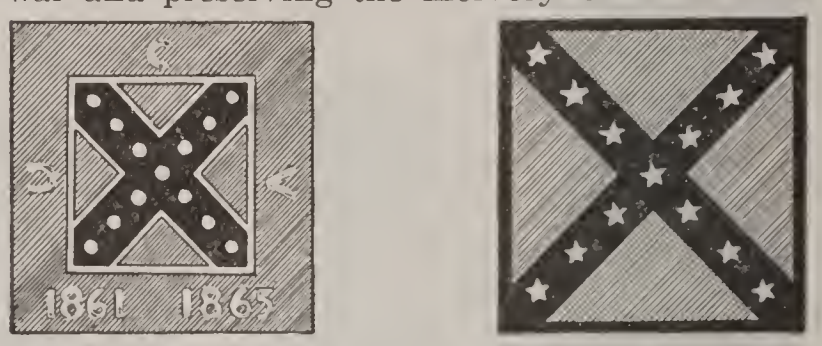
CONEY, *ko' ni,* **ISLAND,** a popular New York seaside resort where sweltering thousands from New York City, Jersey City, Brooklyn and the surrounding country seek pleasure and relief from the heat during the summer months.

LOCATION OF CONEY ISLAND

It is nearly five miles long and at the widest part is about three-quarters of a mile across. It is at the southwestern end of Long Island, nine miles from the Battery, or south end of Manhattan Island, and is reached by boat, trolley, subway or elevated train. For weeks, or days, or only a few hours, people stay at Coney Island to rest, play on the beaches, hear the music or join the throngs of jostling merrymakers at exhibitions, on dancing platforms or thrilling rides. Close at hand are Brighton, West Brighton, Sea Gate and Manhattan Beach resorts.

Historically, Coney Island is famous as the place of Henry Hudson's landing in 1609.

CONFED'ERATE ARMY SOCIETIES, patriotic organizations of the South which, like the Grand Army of the Republic and others of the North, were formed to preserve the memories of the War of Secession. The first of these was organized at New Orleans, La., in 1889. Composed of veterans of the Confederate army or navy, it is known as the United Confederate Veterans. Its purpose, besides strengthening friendships formed during the war and preserving the memory of dead com-

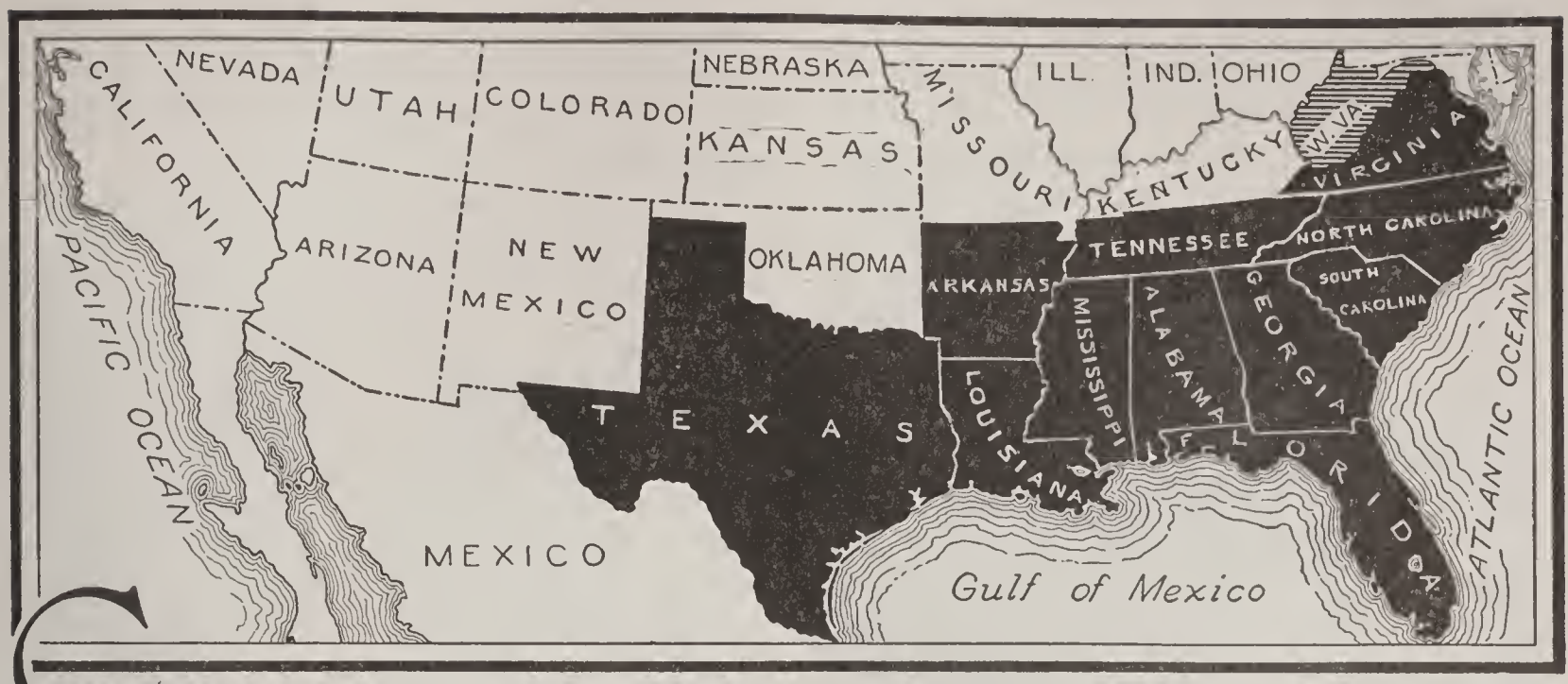


Forms of lapel buttons of the United Confederate Veterans.

rades, is to aid veterans, their widows and orphans. It holds annual reunions, and in the 1,170 camps there were about 55,000 members in 1916. Its official organ is *The Confederate Veteran,* published in Nashville, Tenn.

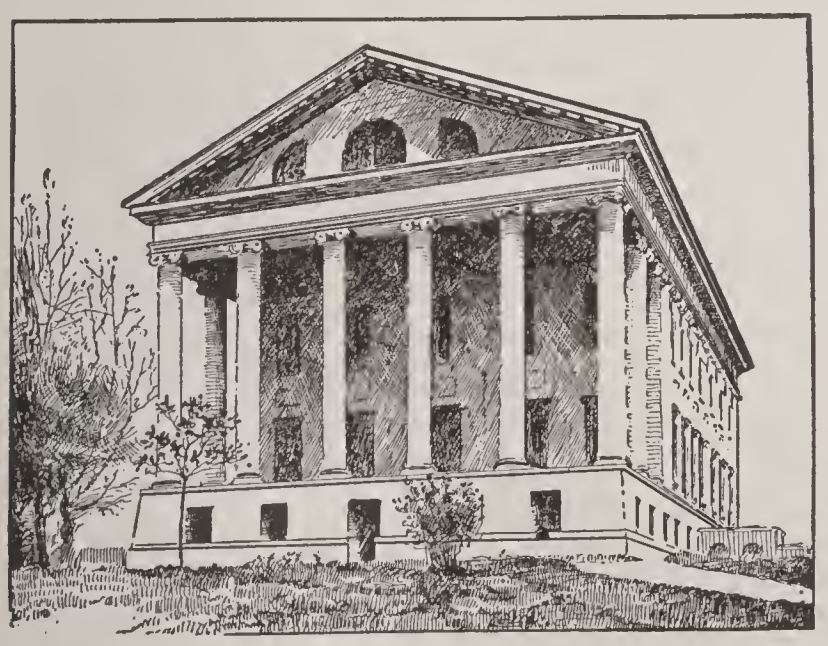
In 1894 the United Daughters of the Confederacy was organized in Nashville, Tenn., by widows, wives, mothers and sisters of those who served honorably in the Confederate army or navy. Its purpose is to honor Confederate soldiers, living or dead, and like the Veterans, to help Confederate soldiers and sailors and their families when in need. Its 1,500 chapters, with over 90,000 members, have helped to establish homes for poor Confederate veterans and their families, have conferred crosses of honor, scholarships, medals and prizes, and have done numerous other worthy deeds.

In 1896 the male descendants of Confederate veterans whose records were honorable organized the society of the United Sons of Confederate Veterans at Richmond, Va. Its chief purpose is the gathering and preserving of historic relics and data from which to write a history of the War of Secession from the Southern standpoint, although it, too, is a benevolent society. Its membership is about 50,000. In 1900 Beauvoir, the home of Jefferson Davis, was purchased by their Mississippi division as a home for soldiers. E.C.B.



CONFEDERATE STATES OF AMERICA. In 1860 and 1861 eleven of the Southern states of the American Union withdrew from the United States and organized a government of their own, which they called the CONFEDERATE STATES OF AMERICA. South Carolina took the lead in the movement, passing its ordinance of secession December 20, 1860. In January, 1861, four other states—Mississippi, Florida, Alabama and Georgia—followed, and February 1 Texas joined their ranks.

This withdrawal from the Union was not a new idea, neither had the thought always been confined to the Southern states. It was implied in the Kentucky and Virginia Resolutions (which see), and also openly advocated by the New England states during the War of 1812. It was again brought forward in the Nullification ordinance of South Carolina in 1832. In 1860 the idea was put into far-reaching effect. (For causes, see WAR OF SECESSION).



CAPITOL BUILDING

The building in Richmond which served as the Confederacy's capitol.

Organization. On February 4, 1861, delegates from the states that had then seceded met at Montgomery, Ala., and organized a provisional government. This was changed to the permanent government when the Constitution was adopted. Jefferson Davis of Mississippi was elected President, and Alexander H. Stephens of Georgia was chosen Vice-President, for one year, and Montgomery was made the temporary capital. After Virginia joined the Confederacy the capital was removed to Richmond. The Constitution was modeled after that of the United States, but differed from it in the following important particulars:

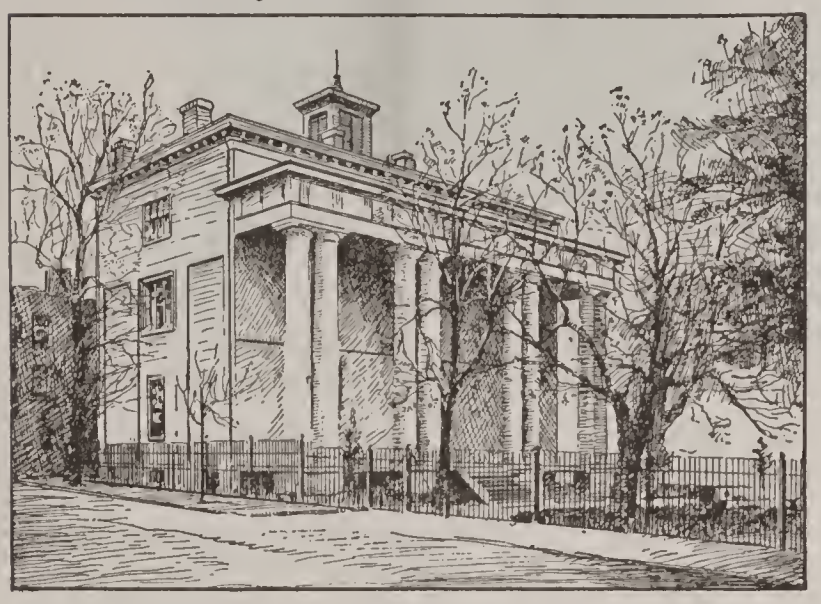
1. The term of the President and Vice-President was fixed at six years, and the President could not succeed himself.
2. Members of the Cabinet were given seats in Congress, with the privilege of debate but without the right to vote.
3. Foreign slave trade was prohibited, but slavery was sanctioned.
4. Congress was forbidden to make appropriations for internal improvements, to levy a protective tariff or to give bounties.
5. A two-thirds' vote of both houses of Congress was necessary to admit a new state into the Confederacy or to make appropriations not asked for by the heads of departments through the President.

President Davis and Vice-President Stephens were elected for a full term of six years before the expiration of their provisional term. The first Cabinet was composed of six men, remarkable for their foresight and ability. With the progress of events changes were made, and during the life of the government a number of other names were added. The following is a complete list of the members, with the dates of their death:

Judah P. Benjamin, Louisiana, Secretary of State, died May 8, 1884; Charles G. Memminger, South Carolina, Secretary of Treasury, died March 7, 1888; George W. Randolph, Virginia, Secretary of War, died April 10, 1878; Stephen R. Mallory, Florida, Secretary of Navy, died No-

vember 9, 1873; Thos. H. Watts, Alabama, Attorney-General, died September 16, 1892; John H. Reagan, Texas, Postmaster-General, died March 6, 1905.

Border States. The Confederate States hoped for a peaceful withdrawal from the Union, and influential men on both sides of the controversy exerted themselves to the ut-



THE PRESIDENT'S MANSION

Official residence of Jefferson Davis, as President, in Richmond.

most to prevent war, but without success. War actually began with the attack on Fort Sumter (which see), April 12, 1861. The fall of the fort was immediately followed by a call for 75,000 volunteers by President Lincoln. Both sides made strong efforts to secure the support of the states lying between those forming the Confederacy and the Ohio River, and also of Missouri, Arkansas, Louisiana and Texas. Of these North Carolina, Virginia, Tennessee, Arkansas, Louisiana and Texas joined the Confederacy. The Federal government secured control of Delaware, Maryland, Kentucky and Missouri before the Confederate sympathizers in those states could organize. The state of West Virginia was formed from that part of Virginia whose inhabitants were in sympathy with the Union.

Foreign Relations. As soon as the government was established representatives were sent to Europe to secure the recognition of the Confederate States of America as an independent government. Before this was done, however, England had recognized the Confederacy as a belligerent, and France, the Netherlands, Spain, Brazil and a few other nations did the same. This recognition of the South gave the Confederate vessels on the high seas the same privileges in the ports of those nations as were granted those of the United States, but it did not grant the privilege of sending representatives to those governments; before that privilege could be secured the fall of Vicksburg and the Union victory at Gettysburg compelled the Confederacy to give up all hope of securing recognition as an independent government.

Financial Measures. Lack of funds was the greatest handicap of the Confederate government. It began without a national treasury and with only a small public fund, but the latter was considerably increased by private donations and by the sale of bonds. But the government was soon obliged to resort to issuing paper money, whose volume increased so rapidly that some months before the end of the war it was practically valueless. Without funds it was impossible to maintain the army in such a degree of efficiency as would enable it to withstand the repeated onslaughts of the Federal forces.

Heroic Efforts. At first success was with the Confederacy, and after the defeat of the Union forces at Bull Run and Fredericksburg several attempts were made by European powers to end the war by persuading the contending nations to make a treaty of peace, but these efforts failed. The resources of the North were greater than those of the South. Moreover, all Southern ports were in a state of blockade, so goods could not be shipped into or out of the Southland. The North was able to keep its army supplied with ammunition, food and clothing, while the army of the South was often without supplies. But the Southern soldiers willingly continued to defend the cause they had espoused, though suffering from hunger and cold and lacking in arms and ammunition.

The Confederate Congress held two sessions, and then it adjourned. The great responsibilities resting upon President Davis made it necessary for him to resort to arbitrary measures to carry on the government, but amidst all these discouragements he held the government together until the fall of Richmond. With the surrender of the Army of Northern Virginia on April 9, 1865, the government of the Confederate States of America came to an end; not ingloriously, as some thought at the time, but as the yielding to a superior force by a brave people who consecrated their all to the cause which they believed to be right.

"Under the sod and the dew,
Waiting the Judgment day,
Love and tears for the blue;
Tears and love for the gray." E.C.B.

Consult Jefferson Davis' *Rise and Fall of the Confederate Government;* Curry's *Civil History of the Government of the Confederate States.*

CONFEDERATION, *kon fed er a' shun,* ARTICLES OF. See ARTICLES OF CONFEDERATION.

CONFUCIUS, *kon fu' shi us* (551-478 B. C.), a famous Chinese sage whose moral teachings, after nearly twenty-five centuries, are still the religious principles of millions of his countrymen. He was not the founder of a religion, in the sense that Christ and Mohammed established faiths, for he had nothing to say of man's relation to a Supreme Being, but as a teacher of practical morality he was one of the most influential men who ever lived. Confucius was born in Shantung, a province of the state of Lu, and was the son of a soldier of royal descent. His father, commander of one of the districts of the province, died when his son was three years old, and though the family was left with very little money, the mother of Confucius educated the boy according to the best ideals of the time. One of the stories told of his childhood is that he was extremely fond of dressing himself in strange garb and conducting religious services, while his playmates acted as worshipers.

CONFUCIUS

Confucius began his life work as a teacher at the age of twenty-two, three years after his marriage. He seems to have parted from his wife and children about this time. For the rest of his life, a period of fifty years, during which he traveled widely in China, he endeavored to teach others his ideas of what is good. By the time he was thirty he had worked out the precepts for which he is remembered, and four years later his first pupils of importance came to him. At this point in his career he had several interviews with Lao-Tse, the founder of Taoism (which see); Confucius, the practical thinker, was much more profoundly impressed with Lao-Tse, the dreamer, than Lao-Tse was with his visitor.

About the year 500 B. C. Confucius was appointed governor of the city of Chung-tu, in his native state of Lu, and shortly afterwards was made minister of crime. As a magistrate he showed such sagacity and practical ability that he roused the jealousy of the governor of the neighboring state of Tsi, whose interference so lessened his authority that he resigned four years later. For the next thirteen years he wandered about from place to place, returning to Lu in his sixty-ninth year, and spending the last five years of his life in retirement. Before he died he had compiled and edited the ancient Chinese writings, which are included in the *Five Classics;* with these are grouped the *Four Books,* written by his disciples. The nine books together constitute the Chinese bible.

Confucianism. The system of religion which was worked out by Confucius, known as CONFUCIANISM, is lacking in spiritual elements. He concerned himself neither with a God nor with the immortality of the soul, but urged men to live righteously while they were in the present world. Goodness, he said, should be practiced for its own sake and not because of a future reward. He emphasized man's duty to his fellow men rather than to a Supreme Being, especially his duty to his parents. Had Confucius written the Ten Commandments of the Mosaic Law he would doubtless have given the highest place to the one beginning, "Honor thy father and thy mother." Respect for parents has now become one of the very roots of Chinese character, and in the filial devotion of the people we see one of the strongest traces of the influence of Confucius. Submission to the state was another of his important doctrines.

The great teacher laid down for his pupils a negative form of Christ's Golden Rule—"Do not do unto others that which you would not like to have them do unto you." His sayings were collected by his followers, and they form a set of proverbs that are full of practical wisdom and good sense. Among them are such maxims, as, "To see the right, and not to do it, is to be a coward," and "Not to withdraw after making an error is itself a new error."

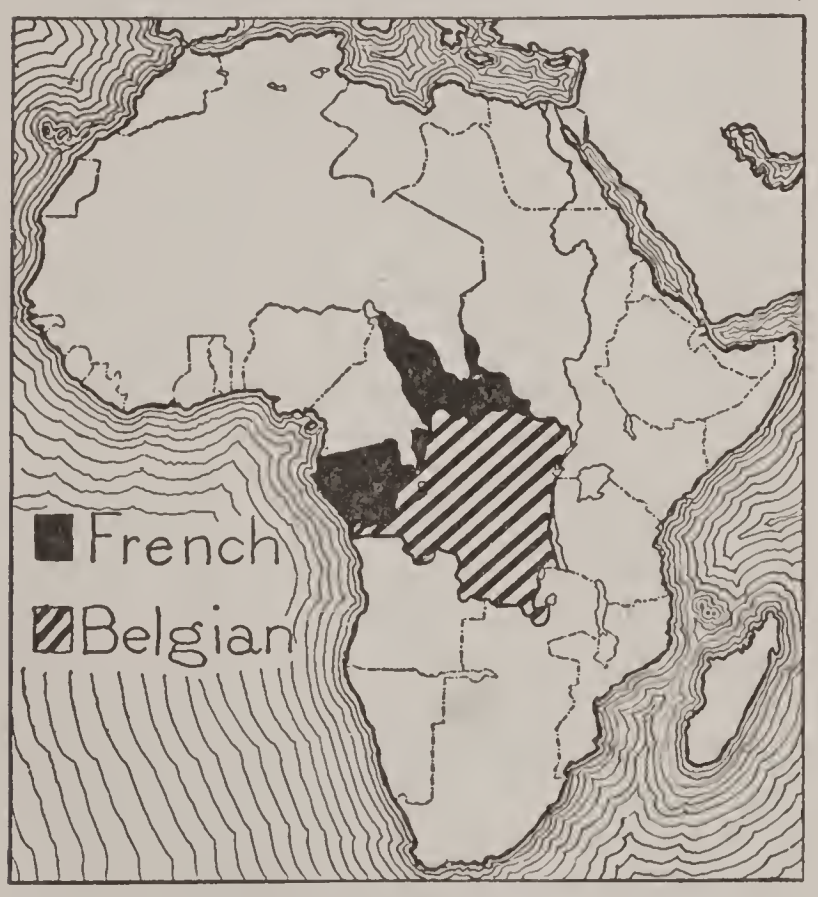
After the death of Confucius he was given the honors due a god, and ceremonies were instituted to perpetuate his teachings, thus making Confucianism practically a state religion. In 1914, after a period in which religion was overshadowed by the revolution which changed the empire into a republic, there was an unsuccessful attempt to reëstablish Confucianism as the state religion. It has about 256,000,000 followers. See CHINA, subhead *Religion;* RELIGION, and references there given. B.M.W.

CONGLOMERATE, *kon glom' er ate,* from Latin words meaning *to roll together,* is a rock

formed by the cementing together of pebbles and broken fragments of other rock by limestone, iron, silica or some other substance which usually forms the main body of the rock. When conglomerate contains a large number of pebbles it is called *pudding stone,* from its resemblance to plum pudding. When a quantity of broken fragments is present it is known as *breccia.*

CONGO, *kong'go,* also spelled KONGO, is the name of two large divisions of equatorial Africa, one under the control of the French, the second annexed to Belgium. The name is taken from the River Congo, which drains practically the whole of the two countries and has a larger volume of water than any other river in the world except the Amazon.

Belgian Congo, a vast area in Central Africa, 909,000 square miles, formerly the *Congo Free State,* occupies the "darkest" part of the Dark Continent, with a population of about 15,000,000 natives and 8,200 Europeans. The country,



THE CONGO REGION

first brought to public notice by H. M. Stanley, the great explorer, has had an eventful history. On his return to the coast, in 1876, Stanley followed the course of the Congo River to the sea. The attention of King Leopold II of Belgium was directed to the great advantages offered by the country, with its vast resources, and his name is inseparably connected with the exploitation of a vast Congo domain.

The climate is healthful, and abundant crops of fruit, cereals and vegetables can be raised. The mineral resources are vast and have not yet been fully developed. There are also great quantities of ivory, but perhaps the most valuable of all resources is the vast supply of rubber, for the Congo forests abound in trees producing this valuable commodity. The rubber plantations were exploited by a syndicate in which the word of Leopold II was law. The powers agreed to hand over this great territory to a company named the International African Association, controlled by the Belgian government. Belgium also reserved the right to annex the territory, which was eventually done with the consent of the United States and all European powers. In 1908 the Congo Free State became Belgian Congo, governed by the home country, with local governors in charge of various districts.

By far the greater part of the commerce of the district is conveyed over the waters of the Congo River. At the beginning of the Belgian occupation, when the commerce was first opened up and the natives were driven under dire penalties to produce a certain quantity of rubber, great indignation was aroused throughout the world on account of the cruelties practiced. The natives were in reality slaves, and Leopold of Belgium, who made vast sums of money out of the rubber trade, was forced in self-defense to send a commission to inquire into actual conditions. The commission partly exonerated the king, but it was proved that atrocities had been committed. When Albert I came to the Belgian throne in 1909 he corrected many evils that had arisen in the Congo during the reign of his uncle, Leopold II.

Within recent years conditions have greatly improved; agriculture is flourishing, and a line of railway, a branch of the Cape-to-Cairo line, has been completed and another is under construction from Elizabethville across Angola to the Atlantic coast (see eight-page colored map, in article AFRICA). Telegraph, postal and telephone systems have been installed, and internal communications have been considerably improved.

The natives are chiefly of Bantu stock and are united in large tribes, all with a certain amount of self-government and gradually coming under the influence of a higher civilization. Being almost entirely inland except for a small strip on the Atlantic coast, where the port of Banana is situated, the country has a warm climate. The days are oppressive, but the nights are cool, the variation in temperature being high, even for the tropics. The great scourge of the country is the tsetse fly which, by the deadly venom of its bite, kills numbers

of cattle and produces the dreaded sleeping sickness among thousands of natives every year (see TSETSE FLY). Steps are being taken to eradicate this insect, to combat the deadly sleeping sickness and improve living conditions.

French Congo. This territory extends along West Central Africa inland to the Congo River, and is bounded on the north by the German Kamerun. It reaches to Lake Chad, on the borders of the Sudan, and covers a total area of about 982,000 square miles. Its forests are the home of the gorilla and the chimpanzee; buffaloes roam the plains, and its rivers and lagoons abound in crocodiles and hippopotamuses. In many parts the rhinoceros is found, and the elephant has not been entirely exterminated, although incessantly hunted for its ivory. Taken altogether, the French Congo may be regarded as one of the most valuable of the French foreign possessions. The country was gradually acquired by exploration and military occupation, commencing at the Atlantic coast and gradually extending inland.

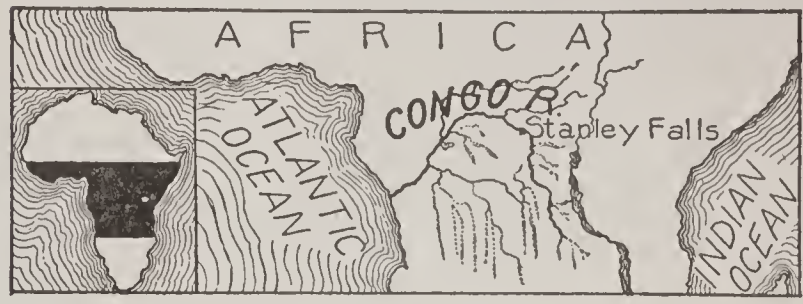
The country is now administered by a commissioner-general, and the home government of France has devoted much time and money to the development of the resources of the colony. The exports consist chiefly of rubber, ivory, wood, coffee, vanilla and palm oil. The climate is not healthful for Europeans, and their prolonged residence there is impossible. The population is estimated at about 6,370,000, mostly hardy natives of Bantu stock. The capital is Libreville, other towns of importance being Loango, Franceville and Brazzaville. Since 1915 more than $500,000 has been expended in improving internal communication and installing telegraph and telephone systems. F.ST.A.

Consult Starr's *Congo Natives;* Ward's *Voice from the Congo.* Stanley's *The Congo and the Founding of the Free State,* published in 1885, is yet an authority on the subject.

Related Subjects. A wider view of the topic will be gained by reference to the following articles in these volumes:

Africa	France (history)
Bantu	Leopold II
Belgium (history)	Rubber
Congo (river)	Stanley, Henry M.

CONGO, *kong'go,* **RIVER,** one of the largest rivers in the world, its volume being exceeded only by that of the Amazon, although only seventh in length. It drains a vast area of West Central Africa and carries much of the commerce of the two territories known as the French and the Belgian Congo. Practically all the vast quantities of rubber shipped out of the Belgian Congo have been transported down this stream. The first definite knowledge obtained of this mighty river was secured by Henry M. Stanley, the African explorer (see



COURSE OF THE CONGO

The small corner map, in dark area, shows the portion of the continent included in the larger map.

STANLEY, HENRY M.). It has its source in the heart of "Darkest Africa," in latitude 9° south, longitude 32° east.

The head stream, known as the Chambezi, flows southwest and empties its waters into Lake Bangweolo. Emerging from the lake it becomes known as the Luapula, which in turn loses itself in Lake Moero. Flowing north from this lake is the great stream of the Lualaba. It does not become known as the Congo until it reaches latitude 4° south. From this point to the sea it is a mighty river, dotted with islands and navigable for more than 1,000 miles. Four tributaries join it in its lower reaches, the Lubilash, the Aruwimi, Ubangi and the Kwa, all combining to form one of the most majestic of the world's waterways. About 300 miles from the mouth is Stanley Pool, in which the river widens into a lake. It leaves the Pool in a broad stream which at its mouth attains a width of over ten miles. In various sections narrows and rapids prevent navigation, but railway lines have been built around these, so there is formed a continuous commercial route for more than half the length of the river, which is estimated at 3,000 miles.

The commercial importance of the Congo has so increased that there are now considerably more than 100 large steamers plying the upper reaches, penetrating inland as far as navigation is possible and bringing down the rich products of the country. These goods are transferred to the railroad, which conveys them to a point 110 miles from the mouth, where they can be loaded upon ocean-going steamers.

The volume of water discharged by the Congo is considerably in excess of that of the Mississippi River; the total area of its drainage basin is not less than 1,600,000 square miles, while the Mississippi-Missouri drainage

basin is 1,200,000 square miles. At its mouth is the port of Banana, which until the building of railroads was the forwarding point for the whole of the vast Congo region, but it has been superseded by both Matadi and Leopoldville. The Congo differes from all other large African rivers in that it has no delta and its mouth is not obstructed by deposits or sand banks. F.ST. A.

CONGREGATIONAL, CHURCH, *kong gre ga' shun al,* a religious denomination of Protestants whose name is derived from the belief of its adherents that every congregation of Christians should be an independent body. The English Congregationalists are known as Independents. Every Congregational body exercises the right of electing or deposing its officers, of disciplining its members and of determining its own forms of worship. There is no appeal to a higher church body or to any high church official or conference, but the advice and coöperation of neighboring churches are often sought.

The modern Congregationalist movement originated at the time of the English Reformation, its earliest advocates having been identified with the radical wing of the Puritans (which see). The most important of its leaders was Robert Browne, who urged separation from the Church of England so zealously that at first the Congregationalists in England were called *Separatists.* Congregationalism was planted in America by the Pilgrim Fathers who settled Plymouth in 1620, and most of the early Puritan churches were founded on the Congregational model.

This denomination in America has always been relatively strongest in the New England and other Eastern states, and it has been notably identified with higher education. Yale, Dartmouth and Amherst colleges and Andover Theological Seminary are among the important institutions which owe their establishment to Congregational enterprise.

The world membership of the denomination is nearly 1,500,000. In Great Britain there are about 5,000 churches and preaching stations, with a membership of about 492,000. The Dominion of Canada and Newfoundland have about 230 churches and preaching stations and nearly 13,000 members. In the United States the Congregationalists number nearly 745,000, and maintain over 6,000 churches.

CONGRESS, *kong'gress.* In the United States this term has been narrowed down to mean one thing—the law-making body of the nation; but it has, as well, a much more general meaning. It is derived from Latin words signifying *a meeting together,* and in international affairs is applied to those assemblies composed of representatives of different nations, called to settle questions affecting the welfare of all of them. It is difficult to overestimate the importance of some of the great European congresses in deciding vexed questions, such as settling boundaries and establishing the balance of power. Some of them have been attended by the sovereigns themselves, and when delegates have been sent they have been invariably the greatest statesmen of the various countries. In its widest sense the word *congress* is applied to those assemblies which draw up treaties of peace to be submitted to their governments, but these are more commonly known as *peace conferences.*

The congresses which have been most influential in European affairs have been the following:

Congress of Vienna, which met in 1814-1815 and adjusted the affairs of Europe after the Napoleonic era (see VIENNA, CONGRESS OF).

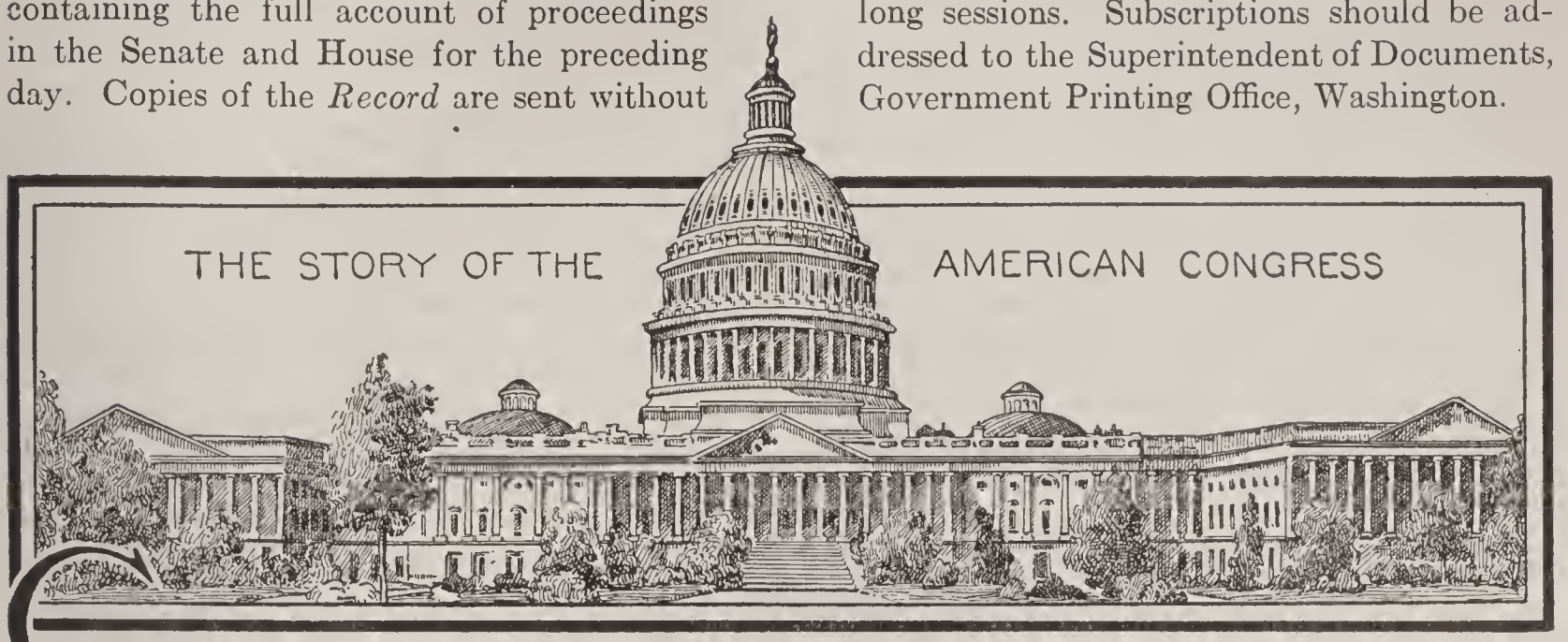
Congress of Paris, which met in 1856 and settled the tangled questions growing out of the Crimean War. This congress marked a step in the unification of Italy, for Cavour's admission as a delegate and the favor shown him constituted a recognition on the part of the great powers of the work he was trying to do. See PARIS, TREATIES OF.

Congress of Berlin, which met in 1878 and concerned itself with the readjustment of the terms of the Treaty of San Stefano. See BERLIN, CONGRESS OF.

Congress of Mothers. See NATIONAL CONGRESS OF MOTHERS.

CONGRESSIONAL RECORD. A printed journal of the daily proceedings of the Congress of the United States has been issued since 1799. Prior to that date only "star-chamber," or secret, sessions were held by the Senate, but after that date all regular sessions were open to the public and publication was required except in the case of "executive sessions." From 1789 to 1824 this publication was known as the *Annals of Congress;* from 1825 to 1837 as the *Register of Debates;* from 1837 to 1874 as the *Congressional Globe,* but since the latter date as the *Congressional Record.* Permission to print undelivered speeches is granted, and they appear in the *Record* as if they had actually been given. Stenographic reports of debates are also re-

vised by the participants before being published. Each member of Congress finds on his desk in the morning a copy of the *Record* containing the full account of proceedings in the Senate and House for the preceding day. Copies of the *Record* are sent without cost to public libraries, and any individual may subscribe for it. The cost is $1.50 for one month, $4 for the short session and $8 for long sessions. Subscriptions should be addressed to the Superintendent of Documents, Government Printing Office, Washington.



CONGRESS OF THE UNITED STATES, the legislative department of the Federal government, composed of members chosen by the forty-eight states, the number determined by the body itself. The territories of Alaska and Hawaii are each represented by a Delegate. The Philippines and Porto Rico send resident commissioners to Congress. The legal term is *The Congress,* although custom has shortened it to *Congress;* the name is a natural development from that applied to meetings of European sovereigns or their envoys to arrange international affairs.

Organization of Congress. The Constitution prescribed that there should be two houses of Congress, a Senate and a House of Representatives. The former is composed of two members from each state, chosen at large for six years, and representing, in a broad way, the sovereignty of the state and all the people of the state; the latter is composed of members whose election is by Congressional districts, each member responsible to the people of his district. Both Senators and Representatives are elected by direct vote of the people. The House of Representatives is called the "popular" branch (derived from *populus,* meaning *people*), because it has from the first been chosen directly from the citizenship every two years, while the election of Senators until 1912 was entrusted to the various state legislatures.

Each House may choose its own officers, except that the Vice-President of the United States, by Constitutional provision, must be President of the Senate. The presiding officer of the House of Representatives is called the Speaker, a name borrowed from the House of Commons of the English Parliament; he is always chosen from the membership of the House, although any private citizen may be selected for the position. The committee memberships in each house are assigned by a special committee appointed for the purpose; with respect to the House of Representatives this is a change from custom dating from the foundation of the government, for until the Sixty-Second Congress (1911) the Speaker arbitrarily appointed all House committees.

Powers of Congress. Unlike the English Parliament, Congress is restricted in its powers of legislation; the former is the only law-making body of the British Isles, while in the United States each state is supreme in local affairs, and "the powers not delegated to the United States by the Constitution, neither prohibited by it to the states, are reserved to the States respectively, or to the people."

The Constitution specifically defines the legislative power that shall be reserved to Congress; from the following lists of powers thus delegated, it will be clear that those broad measures whose effect is more far-reaching than the boundaries of any single state are subject exclusively to national control. Congress shall—

1. Lay and collect all taxes and duties for the support of the Federal Government.
2. Borrow money on the credit of the United States, and pay all national debts.
3. Regulate commerce with foreign nations and among the States.
4. Pass laws regarding naturalization and bankruptcy, all of which shall be uniform in their operation throughout the Union.
5. Coin money, regulate the value of it, and declare what shall be the standards of weights and measures.

6. Fix penalties for counterfeiting the coin and securities of the United States.

7. Establish and control post offices and post roads.

8. Provide the protection of copyrights and patents to authors and inventors.

9. Establish Federal courts in the United States judicial system below the Supreme Court.

10. Define and punish piracy and felonies committed on the high seas.

11. Declare war and grant letters of marque and reprisal in time of war; also raise and support armies and provide and maintain a navy, but no Congress can appropriate money for such purposes beyond the two year limit of its existence.

12. Provide for calling forth the militia to execute the laws, suppress insurrections and repel invasions; also provide for organizing and arming of the militia when called into Government service.

13. Exercise exclusive legislation in the Federal district in which the Capitol is located.

14. Have general power to pass laws which shall be necessary and proper to make effective its legislation on all the matters enumerated above.

Legislation by Committee. Every measure proposed for passage in either house of Congress is referred to a committee for consideration before a vote is taken on it. Especially is the House of Representatives so large that it is an impossibility for the entire membership to give consideration to even a limited number of the thousands of bills annually offered for passage. The committees of Congress are therefore powerful bodies, for they are the key to all legislation. If a committee reports a bill favorably, its acceptance by the House is not likely to be questioned; if an unfavorable report is made, it nearly always defeats the measure. A bill may be killed if the committee to which it is referred does not think it proper to present a report on it, and thousands of bills "die in committee" every year.

There are about fifty committees in each house, and appointments to these are for two years, the life of one Congress. Membership on committees is eagerly sought, especially with respect to those that are most important and powerful. The leading committee of the House of Representatives is the Ways and Means Committee, charged with providing ways and means of raising money to meet the expenses of the government. It prepares all tariff bills, for the Constitution provides that "all bills for raising revenue must originate in the House of Representatives." The similar committee in the Senate is called the Finance Committee, and it is privileged to alter or amend a tariff bill to meet its views. Other leading committees of each house are those on Appropriations, Foreign Affairs, Judiciary, Rules, Military Affairs, Naval Affairs, Elections, Immigration, Rivers and Harbors, Interstate and Foreign Commerce and Insular Affairs.

How a Bill Becomes a Law. For a discussion of the manner in which a bill is passed through Congress or a state legislature, see the article LAW, in regular alphabetical order.

Long and Short Sessions. The life of each Congress is two years, which is the length of the term of a Representative. On the fourth day of March of odd-numbered years each Congress expires by limitation, and on that day begins the life of a new Congress. Unless extraordinary events demand a spring or summer session, the *first session* of a new Congress does not occur until the first Monday in December. It sits, usually, six or seven months, very seldom later than July, and in that time endeavors to pass all legislation of an important nature except appropriation bills. This is called the *long session,* and its length cannot exceed one year; in a crisis it may be kept in continuous session the entire summer and even up to the date of the next regular annual meeting in December. The *second session* of the same Congress begins on the first Monday in December, exactly one year after the first session convened; its existence must terminate on the fourth day of March, at noon. All legislation not taken care of during the *long session* must be rushed through the brief months of the second, or *short session.* During these three months appropriation bills are passed, as well as such emergency bills as demand attention.

Special Session. Extraordinary events may require the attention of Congress at a time when its regular meeting is some months distant. The President is empowered to call Congress in *extraordinary,* or *special, session* whenever in his judgment such a step is necessary. In the published call he states his reasons for convening the legislative branch; and while Congress will give due attention to matters pointed out by the President, its liberty in the direction of other legislation during the special session is unlimited. The length of the special session is determined by the urgency of public business; it may extend up to the day in December when the next regular session begins, in which event it would merge into the latter.

Salaries. Except for the one year of 1795, there has been equal compensation to Senators

and Representatives. In that year Senators received $7 per day, while Representatives received but $6 per day. The several changes in salaries of members of both houses is given in the following table, subject to the exception above noted:

From 1789 to 1815	$ 6.00 per day.
" 1815 to 1817	$1,500 per year.
" 1817 to 1855	$ 8.00 per day.
" 1855 to 1865	$3,000 per year.
" 1865 to 1871	$5,000 per year.
" 1871 to 1874	$7,500 per year.
" 1874 to 1907	$5,000 per year.
" 1907 to ——	$7,500 per year.

Consult Bryce's *American Commonwealth;* Wilson's *Congressional Government.* E.D.F.

Related Subjects. The above article does not enter into detail respecting the organization of either house of Congress nor explain certain topics referred to. In the following articles in these volumes such subjects are treated at length:

Bill	Law
Committee of the Whole	Senate
Representatives, House of	Speaker
	Territory

CONIFERAE, *ko nif' er e,* the botanical name for the trees of the pine family, or the cone-bearers. See CONE-BEARING TREES.

CONJUGATION, *con ju ga' shun.* The conjugation of a verb begins with naming its principal parts, and then follows the verb in systematic order through the different modes, tenses, persons and numbers, in both the active and the passive voice, finishing with a statement of its three participles. The result is a complete and orderly review of the verb, not only in its simple forms, but in the compound forms or verb-phrases. The latter are derived by combining one of the principal parts of the verb with one or more of such auxiliary verbs as *am, were, have, been, will* or *may.*

To shorten so lengthy a process, conjugation is usually carried through the various tenses, modes and voices with a single person and number—the pronoun "I," for example. Such an abbreviated conjugation is called the *synopsis* of a verb.

Conjugation is the *inflection of a verb,* just as declension is the inflection of a noun and comparison the inflection of an adverb.

A Simplified Scheme. A very compact arrangement of the different forms for use in preparing written conjugations is indicated in the following scheme. A point to notice in the accompanying plan is the careful differentiation of *will* and *shall* in the different persons, to indicate simple futurity or expectation, on the one hand, and promise or determination, on the other:

Conjugation of the Verb "Hide"

PRINCIPAL PARTS

Present	*Past*	*Past Participle*
hide	hid	hidden

TENSES	ACTIVE VOICE—INDICATIVE MODE
Present	I *hide,* you *hide,* he *hides;* we, you, they *hide*
Pres. Perfect	I *have,* you *have,* he *has;* we, you, they *have hidden*
Past	I, you, he; we, you, they *hid*
Past Perfect	I, you, he; we, you, they *had hidden*
Future	
(expectation)	I *shall,* you, he *will;* we *shall,* you, they *will hide*
(determination)	I *will,* you, he *shall;* we *will,* you, they *shall hide*
Future Perfect	
(expectation)	I *shall,* you, he *will;* we *shall,* you, they *will have hidden*
(determination)	I *will,* you, he *shall;* we *will,* you, they *shall have hidden*

The conjugation continues in like manner through the subjunctive, imperative and infinitive modes—the modern tendency being to reject the old potential mode; it lists the present, past and past perfect participles, and then repeats the entire process in the passive voice. For all these forms a good text-book on English grammar should be consulted.

A full conjugation would cover also the *interrogative, negative* and *emphatic* forms (the latter conjugated with the auxiliary *do*), and would include *progressive* conjugation—a term used for forms expressing continuous action, as *I am singing, I have been singing, I was singing, I shall be singing,* and similar combinations of the verb *be* with the present participle.

To Stimulate Interest. An excellent means for increasing the interest and practical value of the conjugating exercises is to require the use of additional words after the verb form—an object, an adverb, or an adverbial phrase—so as to make a complete sentence; as, *I hide the book, I hid from the boy, I am hidden from the others,* and so on. Such a plan is especially valuable with verbs like *sit, set, lie, lay, rise, raise,* and others in which a careful distinction must be made between the transitive and intransitive forms. The pupil feels

he is building actual sentences and not merely rehearsing a lifeless set of rules which may or may not be of real use to him. L.M.B.

CONJUNCTION, *kon junk' shun,* a term applied in astronomy to the position of two heavenly bodies at the time of their nearest approach to each other. A planet and the sun are in *superior conjunction* when the planet is beyond the sun. The moon, when "new," is said to be in conjunction; at the full it is at its greatest distance, or *elongation,* from the sun, and is in *opposition.* The moon is in *syzygy* (pronounced *siz' i ji*) when sun, moon and earth are in a nearly straight line, the term *syzygy* meaning *yoked together.*

CONJUNCTION. When the words in the English language were classified by grammarians it was found that they could be divided, according to their use, into eight different groups, known as the *parts of speech.* One of these groups consists of words which do not modify, but serve the sole purpose of connecting. To this group the name of *conjunction* was given, derived from two Latin words meaning *joined with.* A complete grammatical definition would be: A conjunction is a word used to connect phrases, clauses, sentences, or other words. There are two kinds, called *coördinate* conjunctions and *subordinate* conjunctions.

Coördinate Conjunctions. A coördinate conjunction is one which connects two sentences, two words, two phrases, or two clauses which are grammatically equal. The first use may be illustrated by a sentence like this: "He reads well, *but* his sister reads better." *But* is a coördinate conjunction which connects the two simple sentences, "He reads well" and "His sister reads better," each of which is complete in itself. In the sentence, "He *and* his sister read well," *and* is a coördinate conjunction connecting two words which are of the same rank—the pronoun *he* and the noun *sister,* which together form the subject of the sentence.

A coördinate conjunction may connect two phrases: "In red coats *and* in blue coats, the soldiers came marching." It may also connect two clauses which have the same grammatical value, as "He said that a storm had delayed him *or* he would have been there earlier." Both clauses, "that a storm had delayed him," and "he would have been there earlier," are a part of the complete predicate, the object complements of the verb *said.*

The principal coördinate conjunctions are:

Expressing addition: and, also, both, as well as, moreover, further, likewise.

Expressing separation or choice: either, or, neither, nor, else, whether, otherwise.

Expressing opposition: but, yet, still, however, while, only, nevertheless, whereas.

Expressing effect or result: therefore, hence, consequently, so, so that, thus, then.

Conjunctions in Pairs. Many of the coördinate conjunctions frequently occur in pairs, as in the following constructions:

Both...and: *Both* my sister *and* my brother attend school.

Not only...but also: He *not only* reads *but also* writes uncommonly well.

Either...or: *Either* I must go now *or* I cannot go at all.

Neither...nor: *Neither* the child *nor* the man realizes the danger.

Whether...or: *Whether* it rains *or* shines, I intend to leave to-morrow.

Though...yet: *Though* he was nearly exhausted, *yet* he refused to rest.

Subordinate Conjunctions. A subordinate conjunction is one which joins a subordinate clause to the principal clause of a sentence—elements which are not grammatically equal. In such a sentence as, "He can read better *than* I can," *than* is a subordinate conjunction connecting the subordinate clause *than I can* (*read* is understood) with the principal clause *he can read better.*

The commonest of the subordinate conjunctions are:

Expressing time or place: when, as, since, while, before, ere, after, until, where.

Expressing cause or reason: because, since, as, now, whereas, inasmuch as, for.

Expressing condition or supposition: if, unless, though, provided, in case, even if.

Expressing purpose or result: that, so that, lest, in order that, so...as.

Expressing comparison: than (after comparative), as...as, so...as.

The distinction between coördinate and subordinate conjunctions is very important, because it furnishes a means of classifying sentences in analysis. If the conjunction connecting two clauses is coördinate, the two clauses form a *compound sentence;* but if the conjunction is subordinate, the two clauses are unequal and form a *complex sentence.*

Parsing the Conjunction. To parse a conjunction it is necessary only to state what elements of a given sentence it connects and thus to determine its kind, whether coördinate or subordinate. Following is a type sentence:

He that hears much and speaks not at all,
Shall be welcome both in bower and hall.

The first conjunction, the coördinate *and,* connects the two equal verbs *hears* and *speaks.*

Both...and is a coördinate, correlative conjunction, *both* introducing and *and* connecting the two equal nouns, *bower* and *hall.*

Common Errors. The errors most frequently made in the use of the conjunction arise from carelessness in using the correlatives and the comparative *than,* from combining a plural verb with two subject nouns connected by *or* or *nor,* or from fitting a singular verb to two nouns connected by *and.* These and a few other familiar mistakes are covered in the following examples:

John is as old but not taller than Richard, for *John is as old as, but not taller than, Richard,* or *John is as old as Richard, but not taller.* The correlative conjunction is *as...as* and it is just as important to use the second *as* in making the comparison as the first. If the facts warranted, one might say, "John is *older* but not *taller than Richard,*" for *than* may introduce a clause referring back to two adjectives provided both are in the comparative degree.

Mine is as good and better than yours, for *Mine is as good as yours, if not better,* or *if not even better.* The same comment applies as in the foregoing.

I will not go without you come too, or *except you come too,* for *I will not go unless you come too. Without* and *except* are prepositions, not conjunctions, and constitute improprieties of speech when used to connect clauses.

He looks like he had been traveling, for *He looks as though he had been traveling. Like,* too, is a preposition, incorrectly used as a conjunction. This is an exceedingly common error.

Why don't you do like I do? for *Why don't you do as I do? Like* for *as* is as incorrect as *like* for *as though.*

Neither the son nor the father were there on time, for *Neither the son nor the father was there on time.* The correlative *neither...nor,* like *either...or,* requires a singular verb when connecting singular nouns. In such a sentence as *Neither the members nor their friends were charged admission,* the plural verb is, of course, correct.

His enthusiasm and energy makes him a most useful member of the committee, for *His enthusiasm and energy make him a most useful member of the committee.* Two or more singular nouns connected by *and* take a plural verb.

He is not as prospcrous as he looks, for *He is not so prosperous as he looks. As...as* is used when equality is expressed, and *so...as* to express inequality or with a negative statement.

He neither qucstioned me nor my companion, for *He questioned neither me nor my companion. Neither...nor* connects *me* and *companion* and has no reference to the verb *questioned.* The correlative conjunction should be placed close to the words with which it belongs. It would be correct, however, to say *He neither questioned nor detained me and my companion.*

Please try and finish this lesson by noon, for *Please try to finish this lesson by noon. And* must connect equal elements; here the idea is not *please try and please finish,* but *please try to finish.* This use of *and* instead of *to* before an infinitive is a very frequent mistake.

I do not know if I can be there by Tuesday, for *I do not know whether I can be there by Tuesday. If* introduces a condition, *whether* an alternative.

He thought as how he might be able to manage it, for *He thought that he might be able to manage it. How* or *as how* in place of the conjunction *that* is an impropriety.

I don't doubt but what you can do it, or *I don't doubt but that you can do it,* for *I don't doubt that you can do it. But what* is doubly wrong, because *what* is not a conjunction at all, but a relative pronoun. *But that* is equivalent to a negative, so that the sentence as originally given would mean, *I do not doubt anything except that you can do it,* which is clearly not the intended meaning. L.M.B.

CONJURING, *kon'jer ing,* a term which in its older reference applies to the notions of magic and of the command of occult forces. The conjurer was in that sense a sorcerer, or worker of wonders, presumably by alliance with superhuman powers. The modern term applies to arrangement of deceptive appearances that seem to contradict the laws of nature, but are due to sleight-of-hand and mechanical devices. In addition to the clever application of physical principles, two other factors enter into conjuring; the one is the quick and dexterous movements—sleight-of-hand, or legerdemain—by which what is actually done is concealed; the other is the psychological factor of inducing the spectator to make false inferences by misdirecting his attention and guiding his inferences toward a coöperation in the effect.

The ancient conjurers employed physical devices to impress the people with their powers. It is known that by the use of concave mirrors an image was reflected upon the smoke of burning incense and an impressive apparition produced; and that the effect of a voice speaking mysteriously like an oracle was produced by means of tubes and echoes. The tradition of conjuring in India indicates a considerable knowledge of tricks of deception; and amusements of this nature are recorded in the Middle Ages.

The Modern Art. This dates from the middle of the nineteenth century and the contributions of Robert Houdin. At that time there was much interest in automatons, or figures that moved, played cards or chess, answered questions, and the like; in most cases a person was skilfully concealed within and produced the effects. Houdin constructed far more mysterious automatons, in which through levers, strings and tubes inserted in the legs of the stand that held the figure, an assistant sta-

tioned below could manipulate the mechanism. He improved also upon such effects as the illusion of a detached human head, or head and body seemingly floating without legs; or again the mysterious appearance or disappearance (vanishing) of a person in a cabinet. The principle was that of a set of mirrors which gave the effect of clear space under the body, while actually the mirrors concealed the legs; mirrors similarly provided a space for the "vanishing lady." The mystery of a person resting on one elbow supported by a rod, with the body horizontal, was due to a rigid steel frame worn under the clothing; the effect was made more mysterious by the pretense of "mesmerizing" the subject to produce the illusion.

Houdin employed magnets, then quite a novel device; made a chest heavy or light (by secretly turning on an electro-magnet under the stage); he used an electric current to heat a platinum wire, which burned a thread, which released a false lid, and mysteriously made coins appear in a transparent glass box. He refined the devices and made the effects more baffling. In such a trick as pouring all kinds of liquors from the same bottle, he not only used the older principle of controlling the fluid by placing his thumb over an air-hole, but also had different essences in the bottom of the several glasses on the tray, so that by choosing the glass, he could produce the desired flavor. By *palming,* that is, skilfully concealing objects in the hand, by directing the attention to the one hand while the other performed the trick, by clever talk and a mysterious setting, he enhanced the art of the illusionist.

The principles underlying the conjuring tricks of the stage may be readily illustrated. Some of the devices involve rather complex applications of physical and chemical principles; a recent one controls a wooden hand that answers questions, by a wireless telegraphy outfit. But even simple devices, such as a fine silk thread which pulls out of a pack a desired card (which first has been "forced"—that is, pushed forward so that it will be chosen when apparently a free choice of cards is offered)—are often quite as baffling. False bottoms, pockets, hollow wands, substitution of a second object like the first, traps in tables, double openings, facilitate the disappearance and reappearance and transformation of objects.

A single trick described in detail will best illustrate the most important factors involved. Several gold rings are gathered from the audience on the conjurer's wand; they are then thrown on a platter and hammered until they fit in a pistol; the pistol is fired at a set of boxes hung from a cord; the first box is opened with a key and a second taken from inside it, then a third, and a fourth, and a fifth; in the last box are found the original gold rings quite whole and each tied to a bon-bon. What the spectators fail to observe is (1) that the wand is changed from the right to the left hand of the performer as he steps back on the stage, thereby allowing the real rings to slip into the right hand of the performer, while false brass rings which were in the left hand are pushed forward on the wand; (2) that the performer calls for a pistol, which is brought by an assistant, to whom he at the same time gives the gold rings; (3) that as the pistol is fired the assistant pushes a small table (with a fringe) on the stage; (4) that the performer gets this table and places the boxes upon it; (5) that the second box is really taken from the first and the third from the second, but that the last box is pulled from under the table (concealed by the fringe) and the box displayed as though it had come from the next larger one. The assistant had tied the true rings to the bon-bons and placed them in the box while the hammering of the false rings was going on. The ingenuity of a trick is thus seen to depend upon the combined mechanical and psychological effect.

There is a group of tricks which aims to give the impression of the possession of unusual powers. The "second-sight," or "mind-reading," performance answers questions, gives numbers, names articles, etc., held up by the audience. It may be done by means of a code, in which a slight variation of the form of the question is the clue to the answer, performer and assistant having memorized the code. In another form the questions are written (and a concealed impression taken, or blank papers substituted for the originals) and secretly conveyed to an assistant under the stage, who in turn speaks to the blindfolded "mind reader" through a tube; this form has been used as an evidence of "spiritualistic" power of the "medium" to read sealed messages.

The cabinet mystery was also used as an evidence of spirit-force in releasing the medium, or ringing bells, playing on tambourines or producing spirit forms. That all this is within the power of clever trickery has been shown again and again. Much myth and exaggeration

is current in regard to the Oriental tricks, many of which, as described, never happened. The basket trick, in which a slender lad enters a basket through which a sword is pushed to and fro, and then reappears unhurt in the audience, depends upon the flexibility of the basket, the adroitness of the lad in directing the thrust, and the provision of a "double" in like dress. The bush that grows flowers in a few moments is a case of substitution.

Its Psychology. The psychology of conjuring is interesting. It shows how readily the mind is deceived and what slight prepossession will convert a trick into a miracle, how readily the mechanism remains undetected, and how completely natural means account for the appearance. The conjurer is thus the scientific successor of the sorcerer. What has changed is the attitude toward his wonders; they now afford amusement and stimulate wonder and curiosity, while in former days they aroused fear and were accepted as proofs of superhuman power.

It is related that Houdin was sent to the Arabs to overcome their superstitious beliefs in the power of their magicians. He performed with appreciation his trick of making a chest heavy or light (by turning on or off an electromagnet); the chest easily lifted by an Arab one moment was immovable the next. But when on another occasion he announced the same trick as the power to take a man's strength away, the Arabs fled in fear of such uncanny powers. The same performance which convinces a believer of the reality of spirit influence becomes merely a clever trick to another with a more scientific attitude. Yet it remains difficult to impress persons with the fact that what they cannot explain must be accepted as proof of theories which they are inclined to hold, although there is no established connection between their theories and the unaccounted facts. J.J.

Relating to Various Beliefs. The articles on the following topics, while some of them do not bear on conjuring, are of interest in this connection because they, too, deal with pseudo-sciences or superstitions:

Alchemy
Astrology
Clairvoyance
Demonology
Divination
Faith-Cure
Hypnotism
Magic
Medium
Mesmerism
Mind Reading
Necromancy
Occult
Palmistry
Phrenology
Physiognomy
Psychical Research
Psycho-Analysis
Spiritualism
Subconscious
Suggestion
Superstition
Telepathy
Theosophy
Trance
Witchcraft

CONKLING, *kongk'ling,* ROSCOE (1829-1888), an American statesman and lawyer, prominent in the organization of the Republican party and actively connected with its history throughout a long career in the Senate. He was a typical leader in the old school of American politics. When Conkling was first elected to Congress, in 1858, he was mayor of Utica, N. Y., and had become widely known through his campaign speeches for Taylor and Scott. Except for the term between 1863 and 1865, when he held a position in the War Department, he was a member of the House of Representatives until 1867, and in that year became one of the United States Senators for the state of New York.

Conkling was one of the best-known members of the Senate in the administrations of Johnson, Grant and Hayes, and he was an especially active member of the "Stalwart" faction that so strenuously fought for a third term for Grant. He was out of sympathy with the reform element in his party, a bitter opponent of civil service and firm in his belief that the Senators should be consulted in the matter of appointments made by the President.

In 1881 President Garfield nominated an anti-Conkling man for the office of collector of New York, and in spite of Conkling's opposition the appointment was confirmed by the Senate. He and his colleague, Thomas C. Platt, at once resigned, and asked for a reelection from the New York legislature. Their defeat marked the end of Conkling's political career, and he spent the rest of his life in the practice of law in New York City.

CONNAUGHT, *kon'nawt,* ARTHUR WILLIAM PATRICK ALBERT, Duke of (1850-), a British soldier and administrator, Governor-General of Canada from 1911 to 1916. He was the third son of Queen Victoria, and was born at Buckingham Palace on May 1, 1850. He entered the Royal Military Academy, Woolwich, at the age of sixteen, at eighteen was assigned to the Royal Engineers, then served for a few months with the Royal Artillery, and in August, 1869, was transferred to the Rifle Brigade. He was promoted to the rank of captain in 1871 and step by step won promotion to the rank of general in 1893. In Egypt in 1882 he commanded the Guards Brigade at the Battle of Tel-el-Kebir. He was mentioned several times in despatches, was made Companion of the Bath and was thanked by Parliament.

From 1886 to 1890 the Duke was in active command of the Bombay army in India, and then for eight years was in England as commander of the southern district and later of the Aldershot district. He succeeded Lord Roberts in 1900 as commander-in-chief of the forces in Ireland. Four years later, when the war office was reorganized, the Duke was appointed to the newly-created office of inspector-general of the forces, which he held until 1909, when he became commander-in-chief in the Mediterranean, with headquarters at Malta. On October 13, 1911, he became Governor-General of Canada and for five years fulfilled the duties of that exacting office with great skill and was one of the most popular Governors-General Canada has ever known. His last public duty in Canada was to lay the corner-stone of the new Parliament Buildings at Ottawa; the corner-stone of the old structure (destroyed by fire in 1916) was laid by his brother Edward, later King Edward VII, about fifty years earlier.

DUKE OF CONNAUGHT
Governor-General of Canada from 1911 to 1916, and uncle of King George V of England.

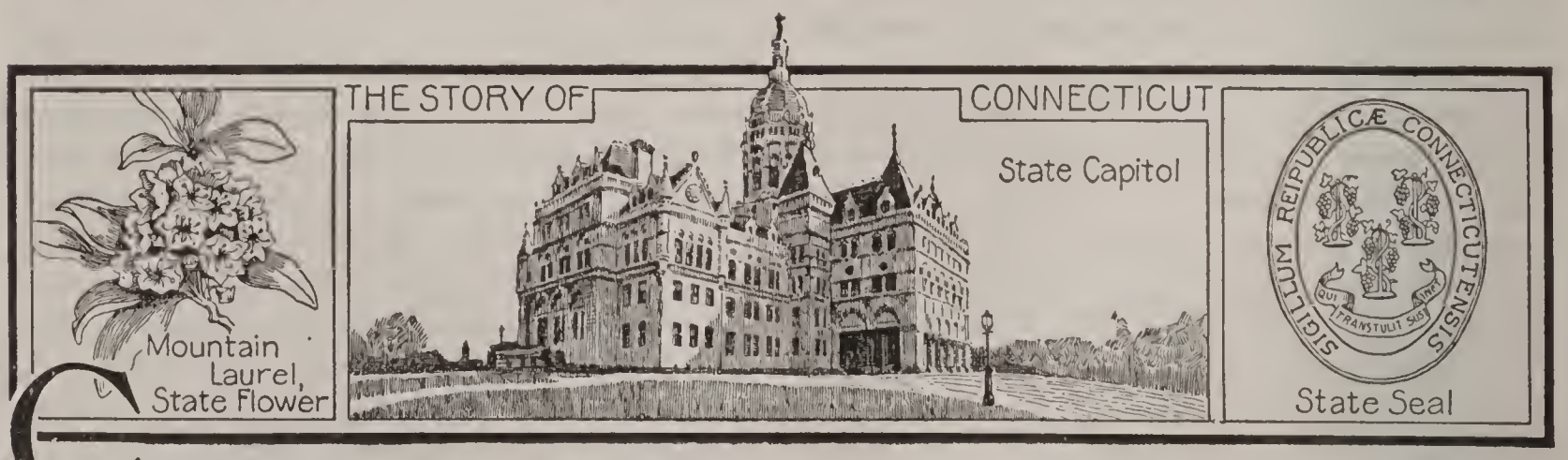
In 1914 it was announced that Prince Alexander of Teck would succeed him as Governor-General, but owing to the outbreak of the War of the Nations the change was postponed. Finally, in 1916, the Duke of Devonshire was appointed his successor. G.H.L.

CONNEAUT, *kon e awt'*, O., on Lake Erie, in Ashtabula County, two miles west of the Pennsylvania state line. Cleveland is sixty-seven miles southwest, and Buffalo is 120 miles northeast. It is on the New York Central and the New York, Chicago & Saint Louis railroads. Car ferries ply between the city and Rondeau and Port Stanley, Canada, across the lake. The area is about two and a half square miles. The population in 1910 was 8,319; in 1920 it was 9,343.

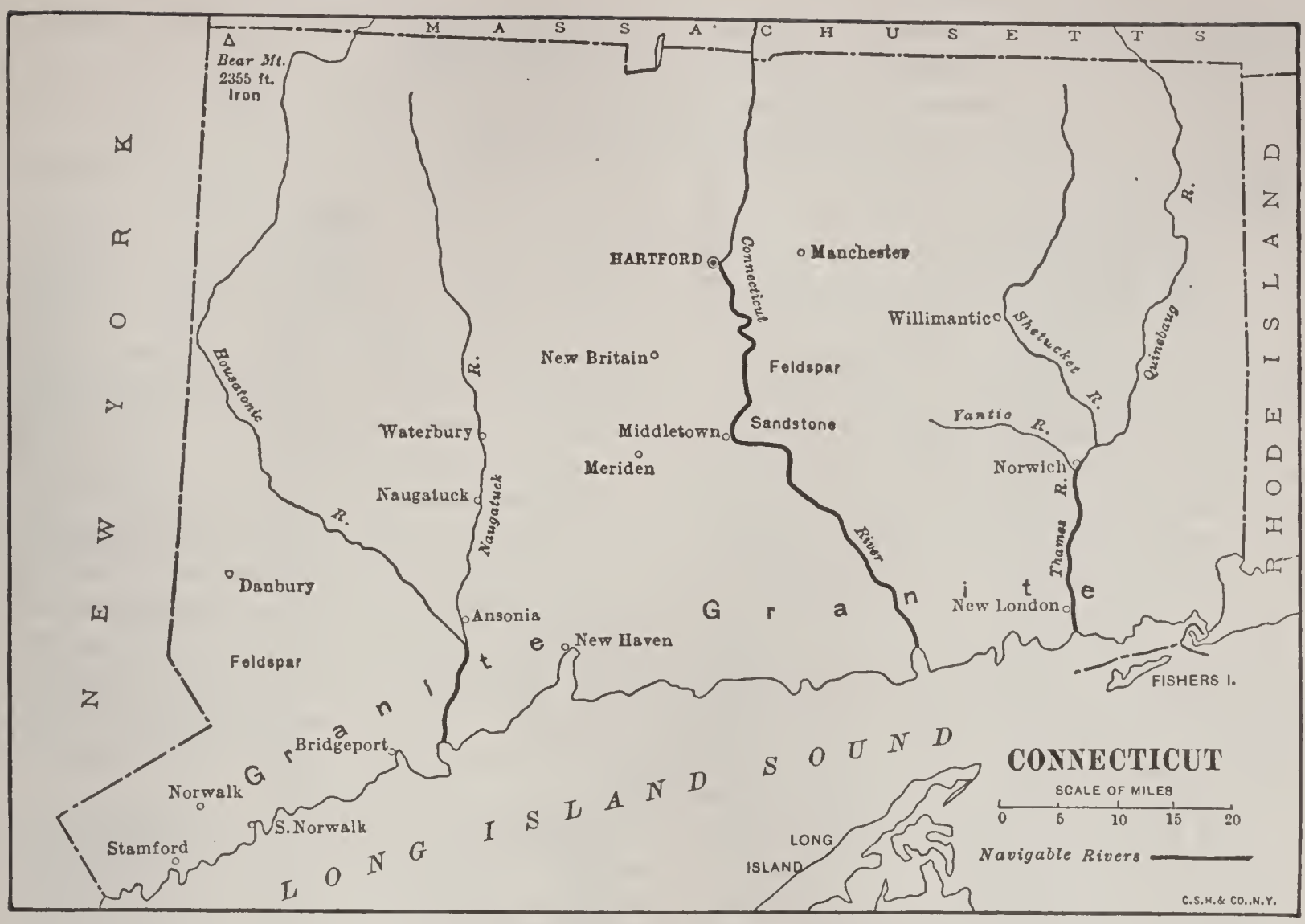
The city is situated along Conneaut Creek, at whose mouth stands a lighthouse. The fine harbor is entered by the largest vessels, and freighting is extensive. Iron ore is shipped here in great quantities from the Duluth field; there are also large cargoes of the produce of the surrounding grain-growing and dairying country and locally manufactured products. Railroad shops, planing and flour mills, manufactories of leather, electric and gas fixtures and lamps, nickel and tin-plate works and foundries represent the principal industries.

The city has a splendid park of forty acres along the lake. Among the important buildings are a Carnegie Library, three hospitals and two banks.

The first white settlers in Northern Ohio located on the site of Conneaut. In 1796 surveyors for the Connecticut Land Company built a log storehouse here, but the permanent settlement was made two years later, and took the Indian name of Conneaut. The town was incorporated in 1832, and received a city charter in 1898. C.W.S.



CONNECTICUT, *kon net' i kut,* the third smallest state in the American Union, leads all the others in the manufacture of brass, clocks and silver-plate. It is also notable for many other important industries and as the home of a large number of insurance companies. Connecticut was one of the original thirteen states. The chief industry of its early colonists was agriculture, but necessity called forth inventive genius, which passed down the generations, and now more patents are issued to the inventors of the state, in proportion to population, than to those of any other American commonwealth. And the gross value of its



OUTLINE MAP OF CONNECTICUT

Showing boundaries, principal waterways and leading cities, quarrying locations, and the highest point of land in the state.

manufactures brought the little state to twelfth in rank, according to the United States census of 1910. In an early day some scheming manufacturers made and sold wooden nutmegs, and the fraud gave to Connecticut the name of NUTMEG STATE. Yet because of the solid characteristics of its people it has also been called the LAND OF STEADY HABITS. The word *Connecticut* is of Indian origin and means *long river*. The mountain laurel is the state flower.

It is nearly one-third larger than Delaware and Rhode Island together, covering about 4,965 square miles, but has only about three-fourths as many people as the city of Philadelphia. It supported a population of 1,114,756 people (census 1910), averaging 231 to the square mile; the Census Bureau reported the number of people in 1920 to be 1,380,585. Only Rhode Island, Massachusetts and New Jersey, in the order named, have greater density of population.

Location and Land Surface. This irregularly-rectangular state lies on Long Island Sound, with New York on the west; it is bounded on the north by Massachusetts and on the east by Rhode Island. Most of the state is somewhat rough, with three important river-valleys. The central one, the Connecticut Valley, is the most fertile, containing about 600 square miles of good, low, flat land, above which rise the Hanging Hills, near Meriden. In the eastern part of the state is the valley of the Thames. The Housatonic-Naugatuck system of rivers is in the western portion of the state where, too, lies the southern continuation of the Berkshire Hills. In the northwest corner are a number of low mountains, Bear Mountain in Salisbury with an altitude of 2,355 feet being the highest; Gridley, Riga, Bradford and Dutton mountains are also of interest. Throughout the state are numerous small lakes and many little rivers, the latter of which, with their falls and rapids, furnish power to great industries. The coast of Connecticut is irregular, with here a rocky point, there a sandy beach, and occasionally a good harbor.

Climate. Owing to winds from the west and southwest the climate is subject to sudden changes, but these winds temper the severe winters and hot summers. The pleasantest season is autumn, though the northwestern hills and the rocky seacoast are frequented all the summer by visitors from New York and near-by cities. The rainfall is sufficient everywhere for agricultural purposes, therefore irrigation is practically unknown.

Mineral Resources. Although Connecticut has deposits of various minerals, only a few are extensive enough to warrant working, and the value of its mineral products is less than $4,000,000 a year. Brown sandstone for building purposes, quarried near Middletown, and marble, flagstone, feldspar and stone suitable for the manufacture of lime and cement are the principal products; Connecticut is the third state in the Union in the production of feldspar. Though of little importance now, iron mines have been worked since 1732, once furnishing material for cannons and ammunition during the Revolutionary War. The iron for the anchor of the famous frigate *Constitution,* popularly known as "Old Ironsides," was from Connecticut.

Inventors and Their Inventions. From the busy, intelligent early settlers of Connecticut sprang many inventive geniuses. Eli Terry, of mantel-clock fame, and others improved the art of clockmaking; Wheeler and Wilson gave the world improved sewing machines; Charles Goodyear developed his process of rubber vulcanizing; Samuel Colt invented the revolver.

Industries. With the aid of plentiful capital, furnished largely by insurance companies, and with abundant water power, the energetic people of Connecticut have built up industries whose products yield over $500,000,000 yearly. They make three-fourths of the country's clocks, over two-thirds of the plated ware and nearly one-half of the brass, bronze and hardware. These industries and the manufacture of rubber goods, textiles, machinery, etc., employ one-fifth of the total population. The most important manufacturing city in the state is Bridgeport. In 1920 the capital invested in manufacturing was $1,343,900,000.

One of the largest thread-manufacturing companies in New England is in Willimantic, and at South Manchester is one of the largest silk mills in the country.

Products of the Soil. The best agricultural lands in the state are sandy, loamy or clay soil, and these are chiefly in the Connecticut River basin and smaller valleys of the highlands. From colonial times the number of farms has rapidly decreased, as agriculture has given way to other industries. Forage crops are of most importance, averaging over 450,000 tons yearly, valued at from $8,000,000 to $10,000,000. The tobacco crop ranks next, the mild-flavored "domestic" leaf of high quality providing the famous "Connecticut wrappers" of cigars. About 30,000,000 pounds of tobacco are produced each year, valued at about $5,000,000. Vegetable-growing is especially important in places near the New York market, where many market gardens are found, this industry, exclusive of potatoes, bringing about $2,000,000 a year. The apple, peach and pear crops are valued at one or two million dollars a year.

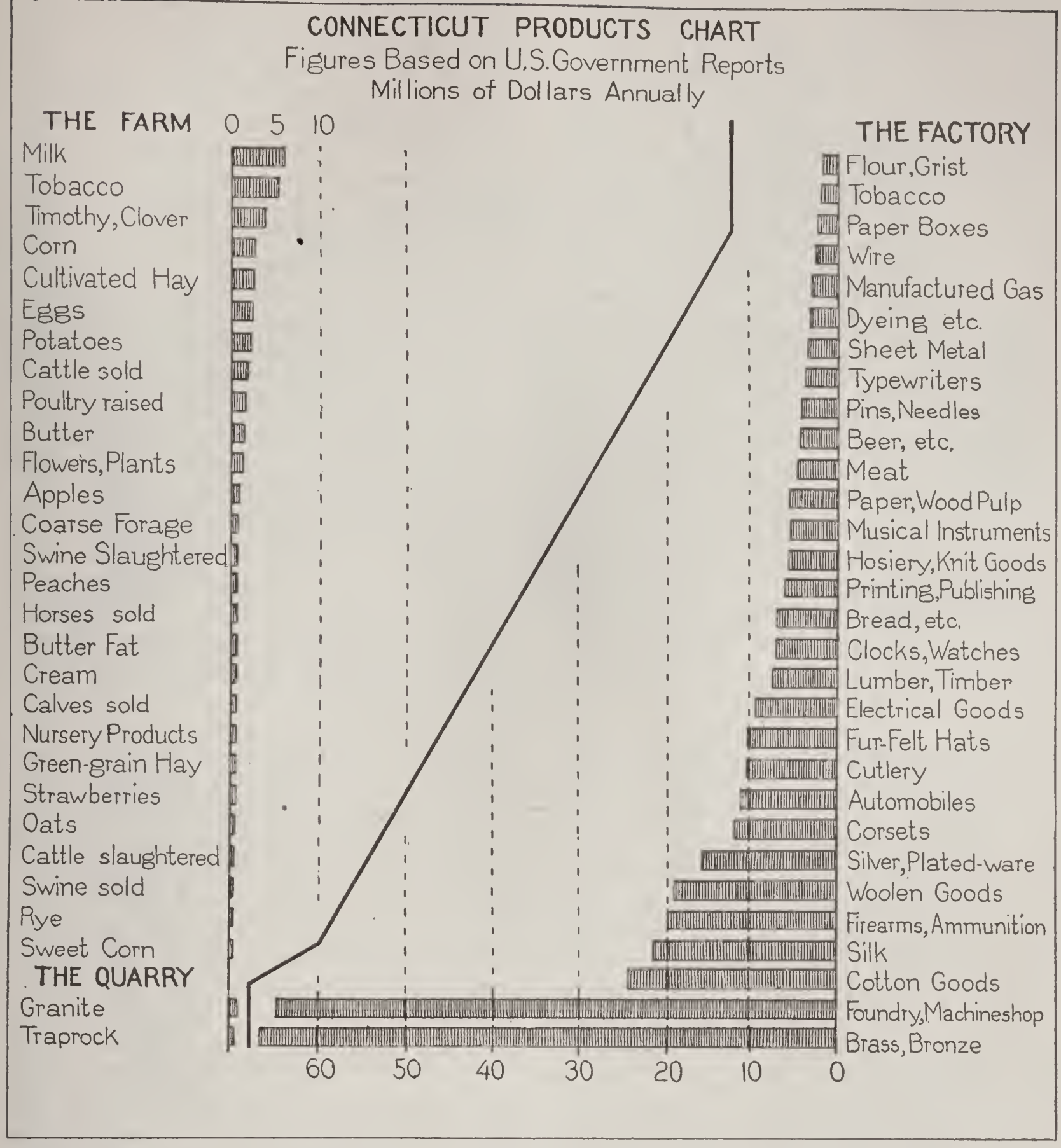
Dairy products are also important. A yearly yield of about 50,000,000 gallons of milk is estimated, and butter made is valued at over $1,000,000. In fisheries, Connecticut ranks third among the New England states, oysters being the most valuable.

Transportation and Commerce. The excellent facilities for transportation have also aided the development of all industries. Over 2,700 miles of railroad afford dirct connection with every part of the country, the largest railroad being the historic New York, New Haven & Hartford. There are also about a thousand miles of electric street railway and hundreds of miles of the finest highways.

Bridgeport, New Haven, New London and several other seaports are conveniently located and have harbors which are ample for all necessary shipping. Hartford, the capital, is at the head of navigation of that important avenue of transportation and commerce, the Connecticut River. In recent years improvements in the river below that city have been made by the United States government.

The People. To be near their work, it is necessary for about ninety per cent of the population to live in the cities, over one-third of the entire population being concentrated in the cities of New Haven, Bridgeport, Hartford and Waterbury. Most of the farmers, business men and factory heads are of native parentage and constitute over thirty-five per cent of the inhabitants. An almost equal number of the people are native-born of foreign parentage, and most of the others are foreign-born. There are only about 15,000 negroes. The majority of skilled workers are English, German or Swedish, but Ireland, Scotland, Italy, Russia, Canada, France, Austria, Hungary and Denmark have contributed to the population.

Education. Provisions for education at public expense have been zealously advanced since the earliest colonial days, so there is a low percentage of uneducated people (see ILLITERACY). All children between the ages of seven and sixteen must attend school, unless excused because they must work after they are fourteen. Besides about 1,400 elementary schools there are



over seventy high schools and four normal schools, and the legislature has authorized instruction in trades and useful occupations in towns and cities. Expenditures for free education amount to almost $9,000,000 yearly.

There is no state university, but there are a number of endowed colleges for higher education and an agricultural college at Storrs. Yale University at New Haven, established in 1701, is one of the strongest in the country; it is described at length under its title in this work. Besides the above there are the Wesleyan University at Middletown, Trinity College at Hartford and the Connecticut College for Women, founded at New London in 1911.

Other Institutions. The state maintains under the supervision of the State Board of Charities hospitals for the insane at Middletown, Norwich and Hartford, reformatories at Cheshire, Meriden, Hartford and New Haven, and the Industrial School for Girls at Middletown. The state also has a school for the feeble-minded at Lakeville, two institutions for the deaf, one for the blind and numerous hospitals and sanitariums throughout the state. The state prison is at Wethersfield.

Government. The constitution of the state adopted in 1818 is still the basic law; up to 1914 it had received thirty-five amendments. The executive officers are the governor, lieutenant-governor, secretary, treasurer and comptroller. The general assembly constitutes the

legislative department. It consists of a senate of thirty-five members and a house of representatives of 258 members, all elected for two years, at a salary of $300 each for regular sessions and mileage for extra sessions. Regular sessions are biennial, commencing in January of odd-numbered years, and cannot continue beyond the first Wednesday after the first Monday in June. Among other powers, the general assembly may grant divorces, confirm titles and annul decisions of minor justices. The judicial department consists of a supreme court of errors with a chief justice and four associate justices, who serve eight years; a superior court with six judges who also serve eight years; and, in some of the principal cities, inferior courts of common pleas whose judges serve four years. The governor nominates and the legislature appoints all judges.

In addition to certain other requisites, such as age, term of residence, and moral character, male electors must be able to read any article of the Constitution of the United States or any section of the state statutes. Women are allowed to vote for school officials.

History. The first settlement was a Dutch trading post at Hartford in 1633. But the English had become interested in the region, and the land from Narragansett Bay to the Pacific having been granted to Lord Saye and Sele and others in 1631, John Winthrop, Jr., was sent from England as governor. He immediately built a fort at Saybrook to prevent the Dutch from getting control of Connecticut and gave settlers who had previously located at Windsor, Wethersfield and Hartford permission to remain. Gradually various ministers and their congregations, to break away from the strict Puritan government in Massachusetts, migrated to the Connecticut Valley. Soon the Connecticut Colony numbered 800 people, including the towns of Windsor, Wethersfield and Hartford. In 1639 they adopted a constitution which was the first written constitution in America, giving the state the name of the CONSTITUTION STATE.

In the meantime another colony, known as the New Haven Colony, was established with a strict government based on the Scriptures. It included New Haven, Milford, Guilford, Stamford and Southold. Though occasionally disturbed by Pequot Indians and the Dutch, both colonies expanded, and Connecticut became known as one of the most prosperous and liberal of the New England colonies. By purchase and colonization it gradually gained possession of most of the present state, and in 1662, under a charter secured from Charles II, absorbed the New Haven Colony. This charter served as its constitution when it became a state in 1776, and was retained until 1818, when a new one was adopted. Tradition tells that when Governor Andros demanded the Connecticut charter in 1687 it was hidden in the hollow trunk of the famous Charter Oak and remained there until 1693.

During the Revolutionary War Connecticut earned the name PROVISION STATE, for troops and supplies were generously supplied. Its war governor, Jonathan Trumbull, was one of the closest friends and advisers of Washington. During the war the British burned Danbury, in 1777, and raided New Haven in 1779. Forts Griswold and Trumbull were taken by the traitor Benedict Arnold in 1781.

Through the influence of delegates from Connecticut at the Constitutional Convention in 1787 the present system of representation in Congress was adopted. Connecticut opposed the War of 1812, and its capital was the seat of the Hartford Convention. Although Hartford and New Haven were joint capitals of Connecticut for many years, in 1873 the former became the sole capital. In 1881 the long-disputed western boundary was definitely settled.

The progress of Connecticut in reforms which are affecting the whole nation is shown in the passage of stringent pure food laws in 1907, the authorization of a public utilities commission in 1911 and two years later the passage of a workingmen's compensation act. T.S.W.

Other Items of Interest. It was in Connecticut that the famous Blue Laws, with their over-strictness, were long supposed to have been in force, but it was later discovered that these were the invention of an exiled colonist whose purpose was ridicule. See BLUE LAWS.

Of all the governors of the thirteen colonies, Trumbull was the only one who at the outbreak of the Revolution was not asked to resign.

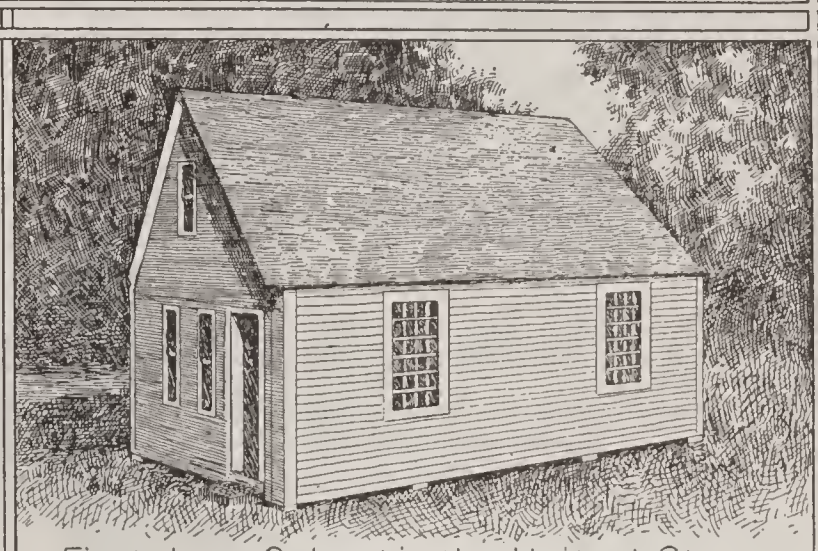
Connecticut was the first colony to instruct its delegates to vote for the Declaration of Independence.

The name *Brother Jonathan,* popularly applied to the United States, is said to have been derived from that of Jonathan Trumbull, war governor of Connecticut.

As early as 1732 the territory was manufacturing men's hats in such quantities that the hat-makers of London complained that imports from Connecticut were ruining their business.

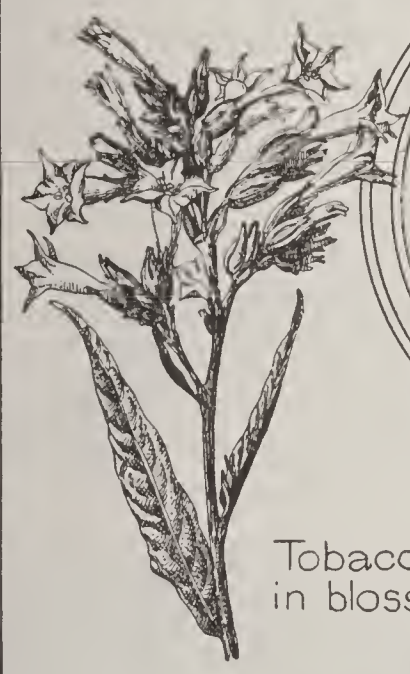
CONNECTICUT

Cities on the Sound



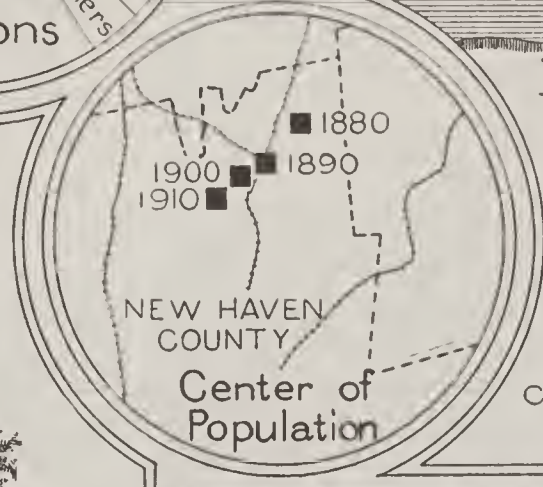
First Law School in the United States
Established at Litchfield in 1784

The State Flag, adopted in 1897. It is of azure blue, with shield of argent white, leaves and fruit in their natural colors



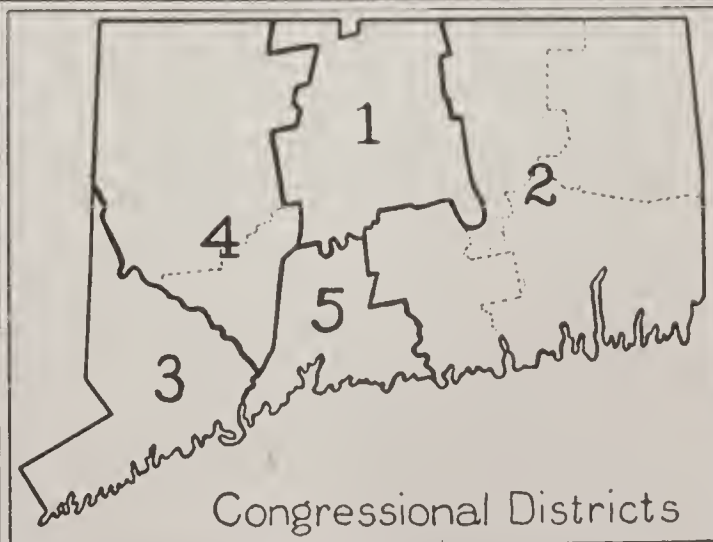
Tobacco plant in blossom

Religions



Center of Population

The Charter Oak



Congressional Districts

Research Questions on Connecticut

An Outline suitable for Connecticut will be found with the article "State."

How many people would be thrown out of work if all the manufacturing plants in the state were shut down?

How old was the colony when it established its first institution of higher learning?

What prominent part did Connecticut have in the making of the Constitution?

How many times as high as the loftiest point in this state is the highest point in Colorado? In Montana?

Could a foreigner who had never learned to read English be naturalized in this state?

Give three popular names which are applied to the state, and tell the origin of each.

For what use is the tobacco of Connecticut especially suited?

Describe the state flag.

How well does the state care for the defective and unfortunate element of its population?

To what native of this state do you owe the fact that you can so easily keep your feet dry when you go out in the rain?

How much is spent on education each year? From what was the larger part of the school fund secured?

How much did the state suffer during the Revolutionary War?

If the populations of Connecticut and Chicago were exchanged, would the state be more or less densely populated than it is at present?

What sea-food could the state least afford to dispense with?

What unusual power has the legislature of this state?

Is irrigation necessary anywhere in the state?

In what way would the climate be different if the prevailing winds came from the north and northwest?

What part has the Federal government had in bettering the facilities for commerce in the state?

How far beyond the present boundaries of the state did the original grant of territory extend?

What part did Connecticut have in the construction of one of the most famous ships ever built in the United States?

How large a proportion of the people live under rural conditions?

What part did the Charter Oak play in the history of Connecticut? What became of it afterward?

What decided change has taken place since colonial days in the relative importance of the various industries?

In the production of what mineral is Connecticut surpassed by only two states?

How many states are smaller than Connecticut? How many are more densely populated? How many have had a longer existence?

In traveling about the state, how many white men would you see, on an average, to one negro?

The school fund of the state was largely established by the sale of the Western Reserve, a large tract of land granted to Connecticut in 1786. This Western Reserve lay within the present state of Ohio.

Consult Clark's *A History of Connecticut, Its Peoples and Institutions;* Johnson's *Connecticut,* in "American Commonwealth" Series.

Related Subjects. The articles on the following topics will furnish more detailed information as to certain phases of the geography, the industrial life and history of Connecticut:

CITIES AND TOWNS

Ansonia	New Britain
Bridgeport	New Haven
Bristol	New London
Danbury	Norwich
Derby	Stamford
Hartford	Torrington
Manchester	Wallingford
Meriden	Waterbury
Middletown	West Haven
Naugatuck	Willimantic

LEADING PRODUCTS

Brass	Oyster
Bronze	Silk
Clock	Thread
Feldspar	Tobacco

RIVERS

Connecticut	Housatonic

UNCLASSIFIED

Berkshire Hills	Hartford Convention
Charter Oak	Long Island Sound
Green Mountains	Yale University

CONNECTICUT, *kon net' i kut,* **RIVER,** the longest river of the New England states, rising far to the north in New Hampshire. It flows southward between New Hampshire and Vermont, through Western Massachusetts and the central part of Connecticut, and finds an outlet to the sea through Long Island Sound. It is nearly 400 miles long, and drains an area of over 11,000 square miles. The valley of the Connecticut is famed for its beauty and fertility, and the stream flows through one of the most prosperous manufacturing sections in the United States. Numerous falls along its course furnish magnificent water power and have determined the location of such thriving industrial centers as Bellows Falls, Vt., Turners Falls and Holyoke, Mass., and Windsor Locks, Conn. Between Hartford and the Sound, a distance of fifty miles, the river is navigable for large steamers, and beyond that point for some distance into Massachusetts it has been made navigable for smaller boats by means of canals. See CONNECTICUT.

CONNELLSVILLE, *kon'elz vil,* PA., the center of the most important coke region of the United States, is situated on the Youghiogheny River, in Fayette County, in the southwestern part of the state. Pittsburgh is about fifty-six miles northwest. Excellent facilities for transportation are offered by the Baltimore & Ohio, the Pennsylvania, the Western Maryland and the Pittsburg & Lake Erie railways. Electric lines also operate between Connellsville and towns north, west and south, and the city is connected by bridge with New Haven, now a part of Connellsville. In 1910 the population was 12,845; it had increased to 13,804 by 1920.

The territory around Connellsville is also rich in coal and natural gas. Until 1913 the coke output of this district was estimated at fifty per cent of the total output of the United States. Besides its high rank as a coke center, Connellsville has one of the largest lock factories in the United States, and its West Pennsylvania Power Plant is the second largest steam electric plant in the country. The Cottage State Hospital, the South Side Hospital (private), a Carnegie Library, and the Federal building, erected in 1912 at a cost of $130,000, are the most notable buildings. Besides the public school system, there is a business college.

Connellsville was settled in 1770, was formed into a township in 1793 and named for Zachariah Connell, the founder. It was incorporated as a borough in 1806 and as a city in 1912. Edward Braddock, the Irish general of French and Indian War fame, is buried here. W.P.S.

CONNOR, *kon'er,* RALPH. See GORDON, CHARLES WILLIAM.

CONSCRIPTION, *kon skrip'shun,* or **DRAFTING,** terms generally applied to enforced enlistment in army or navy. From the days of the ancient Romans, conscription in one form or another has been practiced in Europe. The modern form of conscription, by which every citizen between certain ages who is physically fit to do so is compelled to serve in the army, was first introduced by France. It was an indirect result of the French Revolution, which almost put a stop to recruiting. Partial conscription did not meet the requirements, and in 1792 a law was passed compelling all citizens to undergo military training. Conscription was quickly adopted in nearly all European countries, the term of service being usually three years. There are, however, many variations of the system.

Germany as a political power derived great benefits from conscription. Many authorities trace the marked progress of that country since the Franco-German War to the compulsory military system and the order evolved by military training and discipline. In the United States, Canada and Great Britain conscription had been avoided, excepting on one occasion, in 1863, during the War of Secession, when the United States put such a law into effect. However, the extraordinary demand for millions of men in 1917, in the War of the Nations, led all three countries to resort to conscription. The Home Rule element in Ireland and the French-Canadians of Quebec opposed the act; in the city of Quebec riots occurred. In the United States opposition was voiced by a negligible minority. See page 6174.

CONSERVATION, which means, literally, "the preserving from waste or injury," is applied very generally at the present time to the safeguarding of a nation's natural resources. In this sense, however, much more than preservation is implied. Conservation of natural resources includes also development, prudence, economy and foresight in caring for nature's bountiful gifts. It is the sacred duty of each generation to care for these gifts, so they may be available for the generations to come.' In the words of Gifford Pinchot, its foremost American advocate, "Conservation is the greatest good to the greatest number for the longest time."

The natural resources upon which man depends for his existence are water, forests, minerals and the fertility of the soil. Of these, water is the only one whose supply can be said to be inexhaustible. Yet its unequal distribution, its tremendous powers of destruction in time of flood and its wonderful possibilities

in furnishing power make its use and control one of the important problems of conservation. Surplus water must be stored and made available in time of drought; forest areas that retain the water that would otherwise cause the streams to overflow their banks must be protected from the lumberman's ax; water power must be developed and be protected from private exploitation; streams must be purified for water supply; and swamp and overflow lands must be drained and made useful.

Forests, minerals and products of the soil all belong to the resources which are limited in their supply. The destruction of vast quantities of timber through the ax and the flames of forest fires went on century after century before the world came to a realization of the danger that menaced one of its most valuable assets. In Europe adequate systems of conserving the forest areas have been devised by Germany, France, Austria, Denmark and Belgium, and in this work Germany carries off first honors. Every German state has its forest organization, and there are in the country several schools of forestry. France established a school of forestry at Nancy in 1824, and its Department of Forestry has an admirable system of replanting and cultivating timber lands.

Of the minerals, coal is the most important from an industrial standpoint. This valuable fuel has for years been mined as if the supply were inexhaustible, and official figures show that there has been about one ton wasted to every ton mined. It has been the policy to leave in the ground whatever is not easily mined and to ignore vast quantities of material of a lower grade, much of which has been made inaccessible by the caving in of abandoned shafts. Through the conservation movement man is learning how to mine coal with less waste, and he is learning another lesson, equally important, that water power may be utilized to develop electrical energy and thus lessen the consumption of coal. Wherever electric power generated by water is used instead of steam for transportation, heating or factory purposes, there is a proportionate saving of the world's coal supply.

Conservation in the United States. In America, the conservation movement had its birth in the movement to save the forests, the rapid destruction of which was pointed out as early as 1873 by the American Association for the Advancement of Science. As a result of the agitation then begun, a Bureau of Forestry was created in the Department of Agriculture, and in 1891 the government began to set apart national forest reserves. At the present time the United States has over 185,000 acres of national forest area.

The greatest pioneer in the work of preserving the country's natural wealth was Gifford Pinchot, under whose leadership the United States Forest Service (formerly the Bureau of Forestry) developed to a position of first importance. Pinchot had the vision to see and the courage to declare that the resources of the nation were inseparably bound up in each other and that the country's natural wealth must be protected from two evils—waste and unrestrained and selfish monopoly.

The White House Conference. It was fortunate for the conservation movement that when public sentiment was becoming thoroughly aroused on the subject open-minded and far-seeing statesmen were in national official positions. Acting on Pinchot's suggestion, President Roosevelt brought the underlying forces of the movement to a focus by calling, in May, 1908, a White House conference, or "Conference of the Governors." This historic assembly, which marks the beginning of a definite and recognized public policy in regard to the preservation of the country's resources, was attended by governors from thirty-four states and by numerous distinguished men interested in or connected in some way with the movement.

Shortly after the White House conference, President Roosevelt created a National Conservation Commission, consisting of forty-nine men prominent in political affairs, the industries and science. This commission was divided into four sections, which reported respectively on minerals, waters, forests and soils. The results of their investigations, published in 1909, gave the United States the first inventory of natural resources possessed by any nation, for the report contains a statement as to the country's natural wealth, the amounts already used and the probable duration of their future life.

What Has Been Accomplished. During Roosevelt's administration more than 234,000,000 acres of the government domain, including timber, coal and phosphate lands and lands containing valuable water-power sites, were withdrawn from the possibility of private ownership. This is representative of the present policy of the government and is one of the most important results of the conservation movement. Another achievement of the con-

servatists is the construction of a government railroad in Alaska which will give a tremendous impulse to the development of its rich coal lands (see ALASKA). Not the least-striking evidence of the force of the movement is the failure of several interests to defeat or weaken the government policy of preserving from waste and despoliation the magnificent resources on which the future welfare of the nation depends.

North American Conservation Conference. President Roosevelt was authorized by the National Conservation Committee to invite Canada and Mexico to join with the United States in a movement for the conservation of the resources of the entire American continent. In February, 1909, the North American Conference, consisting of three commissioners from each of the countries represented, met in Washington. Harmony prevailed throughout the sessions and among the valuable plans outlined was the suggestion that steps be taken to make the conservation movement world-wide in scope.

Conservation in Canada. In 1909, the Dominion Parliament passed an act creating a Commission of Conservation for Canada. The aims of this commission were stated as follows:

> It shall be the duty of the Commission to take in consideration all questions which may be brought to its notice relating to the conservation and better utilization of the natural resources of Canada, to make such inventories, collect and disseminate such information, conduct such investigations, inside and outside of Canada, and frame such recommendations as seem conducive to the accomplishment of that end.

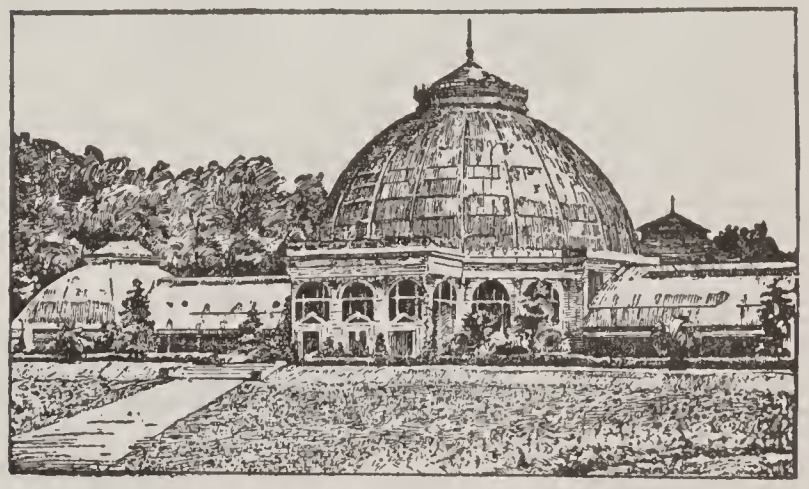
Thirty-two members make up this Commission; of these, the Minister of the Interior, the Minister of Mines and the member of each provincial government in Canada who is charged with the administration of the natural resources of the province are members by virtue of their office. The important subjects upon which the Commission is working are the protection of the standing timber throughout the Dominion, the conservation of water supply and its relation to the forests, the supervision of fish and game, possible economies in the development of the mineral resources, public health and the conservation of the products of the soil. The Dominion has a vast area set aside for national parks, important among which are Rocky Mountain Park and Jasper Park in Alberta, and Yoho Park and Glacier Park in British Columbia. Over 145,000,000 acres are included in the national and provincial forest reserves. W.F.Z.

Related Subjects. The following articles in these volumes will make more clear certain phases of the general topic of conservation:

Bird	Flood
Subhead *Bird Reservations*	Forests and Forestry
Coal	Irrigation
Fire	Parks, National
Subhead *Fire Prevention*	Pinchot, Gifford

CONSERVATIVE, *kon sur' va tiv,* a term applied in Great Britain and Canada to a political party which favors the maintenance of governmental conditions that have been tested and proved good. This party objects to changes in the direction of new and untried measures. One of the greatest leaders the Conservative party ever had was the Earl of Beaconsfield. Joseph Chamberlain, one of England's ablest men, left the ranks of the Radical party and joined the Conservative side. Sir Robert Borden, a Premier of the Dominion of Canada, is a strong type of the old Conservative party, formerly known as "Tories" in England. The Conservatives have lost ground during recent years as progressive ideas have taken root and men with eloquence to expound them have risen from the ranks of the people.

CONSERVATORY, *kon sur' va to ri,* a name applied to a school devoted to instruction in all branches of music. The word was originally the Italian word *conservatorio,* which means a place for keeping anything. In the Italian



A PLANT CONSERVATORY
Typical form of building, glass-covered.

religious conservatorios, where orphan children were cared for, special attention was given to teaching music and declamation; hence its modern application. The first conservatory is said to have been founded in Naples in 1537. Perhaps the most famous school is the French *Conservatoire de Musique,* established in 1795. In England these schools are not called conservatories, because that name is there given to a place devoted exclusively to flowers; but the Royal Academy of Music in London, the

Guildhall School, and others have the same functions. Every great city in America has a conservatory of music, and some of these are known throughout the continent among musicians. In America the name is also applied to a botanical garden or to a lesser display of flowers and shrubs.

CONSONANT, *kon'so nant,* a letter which cannot be sounded perfectly without a vowel letter, and which in being uttered requires more or less obstruction of the breath by the tongue, lips and teeth. *L, m, n,* and *r* are called *liquid* consonants, as they are more easily uttered than others. *B, d, p, k, t* and hard *g* are called *mute* consonants, as in pronouncing them scarcely a sound is emitted, and they really require a vowel before or after, as *ap, pa, at, ta. S, z* and *v* are consonants which do not necessarily require connecting vowels, and are really semi-vowels. See ALPHABET; VOWEL.

CONSPIRACY, *kon spir' a si,* an agreement between two or more persons to carry into effect an unlawful purpose. In order to render the offense of conspiracy complete it is not necessary that any act should really be committed following the unlawful agreement, or that any person should actually be defrauded or injured; simply the act of conspiring, or planning, constitutes the crime. Each person involved is criminally responsible for everything resulting from such purpose, whether specifically intended or not. Conspiracy is punishable with fine or imprisonment; fines may be as high as $10,000 and punishment as great as fourteen years' imprisonment. If the loss of human life results from a conspiracy the more serious charge of murder is lodged against those involved.

CONSTABLE, *kun'sta b'l,* the chief peace officer in rural communities, including unincorporated villages. The constable not only enforces the laws, makes arrests and imprisonments, but has right of search and authority to execute processes. In sparsely-settled sections he is often tax collector and overseer of roads. There is no uniformity in the duties of a constable, as the laws respecting these may vary in the different states or provinces. In colonial times the office was of high importance. Compensation may be either in salary or in a fee for each service performed.

CONSTANCE, *kon'stahnts,* LAKE, also spelled KONSTANZ, is a beautiful lake in Central Europe, through which the River Rhine flows. It is situated about 1,300 feet above the sea at the north base of the Alps, and is bounded by Switzerland, Austria and the German states of Bavaria, Baden and Württemberg. It is about forty miles long and nine miles wide, and is divided into two branches at its northwest extremity. The north branch is called

LOCATION MAP

Ueberlinger See, the south, Untersee, or Zeller See. The surrounding country is given over to agriculture, with orchards and gardens, and dotted with interesting castle ruins. A characteristic of Lake Constance which cannot be explained is its occasional sudden rise and fall. In 1770 it rose in one hour about twenty-four feet above ordinary level.

CONSTANTINE, *kon'stan tine,* CAIUS FLAVIUS VALERIUS CONSTANTINUS (274-337), a Roman emperor called THE GREAT. In his reign Christianity was adopted as the religion of the empire, and the capital was removed from Rome to Byzantium; this latter city was

ARCH OF CONSTANTINE

renamed Constantinople, in his honor. He was the son of Emperor Constantine Chlorus, after whose death in 306 he was chosen emperor of the West. In 325 he became sole head of the Roman Empire. Indulgent with his subjects, he was a favorite, and his administration was marked by a wise spirit of reform.

He died in 337 near Nicomedia, and the empire was divided among his three sons, Constantine, Constantius and Constans. This act was considered a grave political error, for it made three weak governments out of one of growing strength.

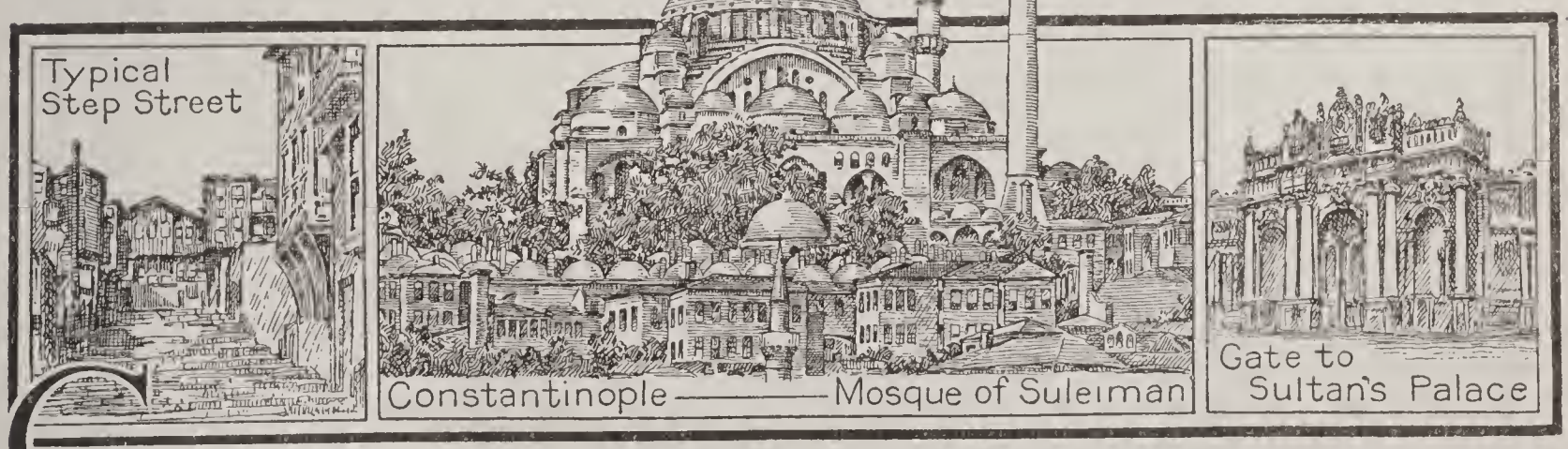
Arch of Constantine, a famous triumphal arch erected in Rome in 315 in memory of the victory of Constantine the Great over Maxentius, another Roman emperor. To-day it is the best preserved of ancient Roman monuments. The finest parts were either taken or copied from the Arch of Trajan, however, so do not properly represent the victories of Constantine.

CONSTANTINE I (1868-), king of Greece, the son and successor of George I, who was assassinated at Saloniki, in 1913, towards the close of the Balkan struggle which began in 1912. Constantine was born at Athens, was brought up in the Orthodox Greek faith, and was educated at Berlin and Leipzig. He was given a thorough military training, and commanded the Greek forces against Turkey in the unhappy war of 1897. His failure in that struggle made him extremely unpopular, but he more than redeemed his reputation by his brilliant service in the Balkan Wars, especially by his capture of Saloniki and Janina from the Turks. He came to the throne a national hero, and as a result of the treaties of London (May 20, 1913) and of Bucharest (August 10, 1913), ruled over territory twice as great as that which his father had governed (see BALKAN WARS).

CONSTANTINE I

His endeavor to remain neutral in the War of the Nations gave rise to many painful experiences.

At the beginning of the War of the Nations, in 1914, King Constantine was confronted by peculiarly-difficult problems. Greek independence was originally won by the aid of Great Britain and the allied powers, and there was a strong feeling among the Greeks that their country should join them. King Constantine, on the contrary, was said to be strongly pro-German, though he himself insisted that he was neutral. His sympathies were doubtless influenced by his own education in Germany, and by his wife, Queen Sophia, who is a sister of Emperor William II. It is interesting to note, however, that Constantine is related by blood to the royal families of Russia and Great Britain. His father, King George I, was a brother of Queen Alexandra, the wife of King Edward VII and mother of King George V of Great Britain. Another sister of King George of Greece was Princess Dagmar, who married Czar Alexander III and became the mother of Czar Nicholas II. Constantine's mother, also a Russian, was a first cousin of Czar Alexander III. Allied pressure upon Greece drove him from the throne June 12, 1917, and he took refuge in Switzerland. He was restored, however, in 1920. For additional details, see article GREECE, subtitle *History*.



CONSTANTINOPLE, *kon stan ti no'-p'l,* the capital and largest city of the Turkish Empire, and one of the oldest cities of the world. It crowns a hilly promontory on the frontier of Europe, at the southern end of the long, narrow Bosporus, which joins the Black Sea and the Sea of Marmora, and separates Turkey in Europe from Asiatic Turkey, across the strait. The view of Constantinople from the sea is one of striking beauty. Small wo-

der that a city so admirably situated for defense and for commercial glory should be coveted for centuries by the nations of Western Europe, or that the allies in the second year of the War of the Nations should sacrifice over 100,000 lives in a vain effort to wrest it from their Turkish enemies.

Leading from the Sea of Marmora to the Aegean Sea is the narrow historic channel known as the Dardanelles. To protect their city from capture—for they knew that a hostile fleet might some day attempt to force a passage of the channel—the Turks had erected a series of forts along both shores. The memorable campaign in the Dardanelles, which lasted nearly a year, ended late in 1915 with the Turks in secure possession of their ancient city, and Constantinople had revealed once more the strategic importance of its site.

Centuries ago the commercial and defensive advantages of the city on the Bosporus made so strong an appeal to the Roman emperor, Constantine the Great, that in A.D. 330 he chose it to be the capital of his empire, changing its ancient name of *Byzantium* to Constantinople, "the city of Constantine." The present Constantinople is a city of many cities. Stamboul, the original site and the Mohammedan center, occupies a three-cornered section, which is bounded on two sides by the Sea of Marmora and the Golden Horn, the splendid riverlike harbor of the Bosporus, and on the land side by the great fortress walls built centuries ago by the Byzantine emperors. Of these partly-ruined fortifications, the most famous is the double wall erected in 447 by Emperor Theodosius. On the north and opposite shore of the Golden Horn lie the suburbs of Galata and Pera, connected with Stamboul by bridges. Galata is the business part of Constantinople; Pera is the foreigners' quarter and the most modern section of the city. Across the Bosporus, on the Asiatic shore, is the suburb of Scutari, which is governed as a part of the political district of Constantinople.

The City of To-day. Under the weak and non-progressive rule of the Turks, Constantinople remained for centuries a backward and unsanitary place, though its many picturesque features lifted it above the commonplace. When, in 1908-1909, the revolution of the Young Turks dethroned Sultan Abdul Hamid, a new era of modernization began. In 1910 over 200,000 homeless dogs, disease-spreading scavengers of the streets, were driven to a neighboring island and left there to die of starvation. A broad, granite-paved bridge replaces the ancient structure that formerly connected Stamboul and Galata, and the streets have been widened and paved with granite blocks.

In the fall of 1913 electric cars were introduced; during the next year telephones were

CONSTANTINOPLE AND VICINITY

used for the first time, and electric lighting has superseded gas illumination. Cement fireproof buildings are being erected in Stamboul to replace the old wooden structures which many recent fires have swept away. Modern wagons and motor trucks are beginning to be seen in the streets, carrying the loads that for centuries were packed on the backs of strong burden-bearers known as *hamals*.

Even the Grand Bazar in Stamboul, with its narrow, roofed-in alleys and its 3,000 quaint little shops, of time-honored fame as a place to dazzle the unwary tourist and relieve him of his money, is feeling the effect of modern ideas. To the foreign visitor its rich and varied Oriental treasures will always be an attraction not to be resisted, but the wealthier residents of Constantinople prefer to do their purchasing in the fashionable shops on the Grande Rue, in Pera. The picturesque headgear of the Turks, the red *fez,* still sets Constantinople apart from other European cities, but Mohammedan women may now expose their faces in public without fear of punishment. An adequate Turkish postal system is promised to replace the old system, under which each of the Great Powers will have its own post office.

Through all of the changes wrought by time, Constantinople has remained a city of mosques—monuments of the power of Mo-

THE "CITY OF CONSTANTINE."

For more than 1,500 years Constantinople has been one of the queen cities of the world. In the illustration the Golden Horn separates the larger city from one of its suburbs, Galata.

hammedanism. The most magnificent of its churches, the Mosque of Saint Sophia, which was erected by Emperor Justinian in the sixth century as a Christian temple, has been the glory of Islam since the Turkish occupation of the city in 1453. The four minarets and lofty dome of the Mosque of Suleiman, an edifice built between the years 1550 and 1566, give added distinction to this minaretted city. There are also many other structures of historic interest—the Serpent Column, brought to Constantinople by Constantine from Delphi, where it had stood for eight centuries; the splendid Museum of Antiquities, in Seraglio Park; the Castle of Seven Towers, once a government house of execution; the hippodrome, completed by Constantine and the scene of many public festivals; not the least of the wonders of the city are the several fine aqueducts whose underground cisterns are among the largest in the world. South of the Museum of Antiquities is the famous group of government buildings known as the Sublime Porte.

Constantinople offers free instruction to its people through numerous elementary public schools connected with the mosques, and through about 170 secondary schools. In 1900 there was opened a university, with departments of philosophy, Mohammedan theology, mathematics, law and medicine. Robert College, an American institution for men, founded in 1863, is also of importance. There are, in addition, several schools conducted by the French, the Imperial Art School and the Greek National School, the latter supplying many teachers for the Greek schools in Turkey.

The handmade wares of Constantinople, displayed in picturesque bazars and street shops, are more important than the products of its factories, which consist mainly of tobacco goods, fezzes and iron wares. Food products, textiles, coal, metal ware, instruments and implements of a widely-varied nature, petroleum and wood are brought into the city; carpets and rugs, lambskins and wool, attar of roses, embroideries and filigree work are exported. Under normal conditions over 20,000 ships enter the Golden Horn each year; this magnificent harbor can accommodate more than 1,000 of the largest ocean vessels. Since 1888 the city has enjoyed direct railroad connection with the outside world, and small steamboats and ferries carry passengers from Stamboul to the suburbs. It is estimated that the city and its suburbs have a population of 1,250,000.

History. In the myths of ancient Greece we read that the Argonauts, under the leadership of Jason, sailed up the Bosporus, long before a city called Byzantium was founded on its shores by Greek adventurers. This was in the sixth century before Christ. In 513 B. C. the Persian monarch, Darius II, crossed the Bosporus at the point where Robert College now stands, and for a brief period he controlled the place. After its name was changed to Constantinople, the city became the center of Greek civilization in the East, and in 395 it was made the capital of the Byzantine, or Eastern, Empire.

For over a thousand years it was subjected to the attacks of hostile nations; three times it fell, in 1203 and 1204 to the armies of the Crusaders, and in 1453 to the conquering Turks, led by Mohammed, or Muhammad, II. That year, 1453, is one of the chief dates in European history. The capture of the city sent as fugitives to Western Europe hundreds of Greek scholars who carried with them priceless manuscripts of the Greek classics, and in this way gave new impetus to the revival of learning. During the centuries of Turkish rule Constantinople was an important factor in Eastern politics. In the War of the Nations the allies vainly tried to capture it (1915). After the war the city was governed by a mandate under the authority of the League of Nations. Turkey did not lose its bit of European territory, however.

J.R.

Related Subjects. The reader who is interested in the history and life of Constantinople will find the following articles helpful:

Bosporus
Byzantine Empire
Constantine
Crusades
Dardanelles
Golden Horn
Jason
Renaissance
Scutari
Sophia, Church of Saint
With illustration in article *Architecture*
War of the Nations

CONSTELLATION, *kon stel a' shun,* a word derived from a Latin term meaning *studded with stars,* and applied in astronomy to groups of stars which have been classed together and named for the purpose of identification. It is generally considered that the naming of the constellations dates back to some very primitive civilization in the East. From the banks of the Euphrates, probably, the divisions and names spread into Egypt, Greece, Rome and thence to Western countries. The names were usually those of animals or of some event or person in ancient mythology.

The most familiar constellation in the north-

ern hemisphere is Ursa Major, commonly called *The Dipper,* which can be readily distinguished on any clear night, shining brightly in the region of the North Pole. For a map of the heavens, showing many constellations, see ASTRONOMY.

CONSTITUTION, *kon sti tu' shun.* When a debating society or a club is organized there is adopted a set of basic principles by which all members of the society or club agree to be governed. These rules form the *constitution* of the organization; to this may be added for the conduct of members a set of rules called by-laws, but no by-law may declare for any principle not permitted in the constitution. A constitution is sometimes called a fundamental law, because all other laws passed by the organization must agree with the rules laid down in the constitution.

The constitution of a nation is the body of laws which underlie the principles by which its government is guided. In most free governments it is the supreme law of the land, and no government official or legislative body can make rules or enact laws contrary to it. The government of Great Britain is a noted exception to the above statement. There Parliament is supreme, and can enact such legislation as the times and conditions of the empire make advisable.

A constitution differs from laws enacted by legislative bodies in the following particulars: It is adopted by the people, in republics, or by the highest authority, in case of monarchical governments. It cannot be repealed or amended by any legislative body without the consent of the authority by which it was adopted. For these reasons constitutions are not easily changed. See CONSTITUTION OF THE UNITED STATES; BRITISH NORTH AMERICA ACT.

CONSTITUTION, THE, a war vessel famed in the history of the United States under the popular name of *Old Ironsides,* and now given permanent anchorage in the Boston navy yard. Launched on October 20, 1797, this splendid frigate passed unharmed through the war with the Barbary powers, as Commander Preble's flagship. In 1812, under command of Captain Isaac Hull, the vessel fought a famous battle off Cape Race with the *Guerrière,* an English frigate, which it sank. After a number of other severe but victorious battles, in 1830 the *Constitution* was condemned as unseaworthy and was ordered to be destroyed. But the poem *Old Ironsides,* by Oliver Wendell Holmes, in which he says—

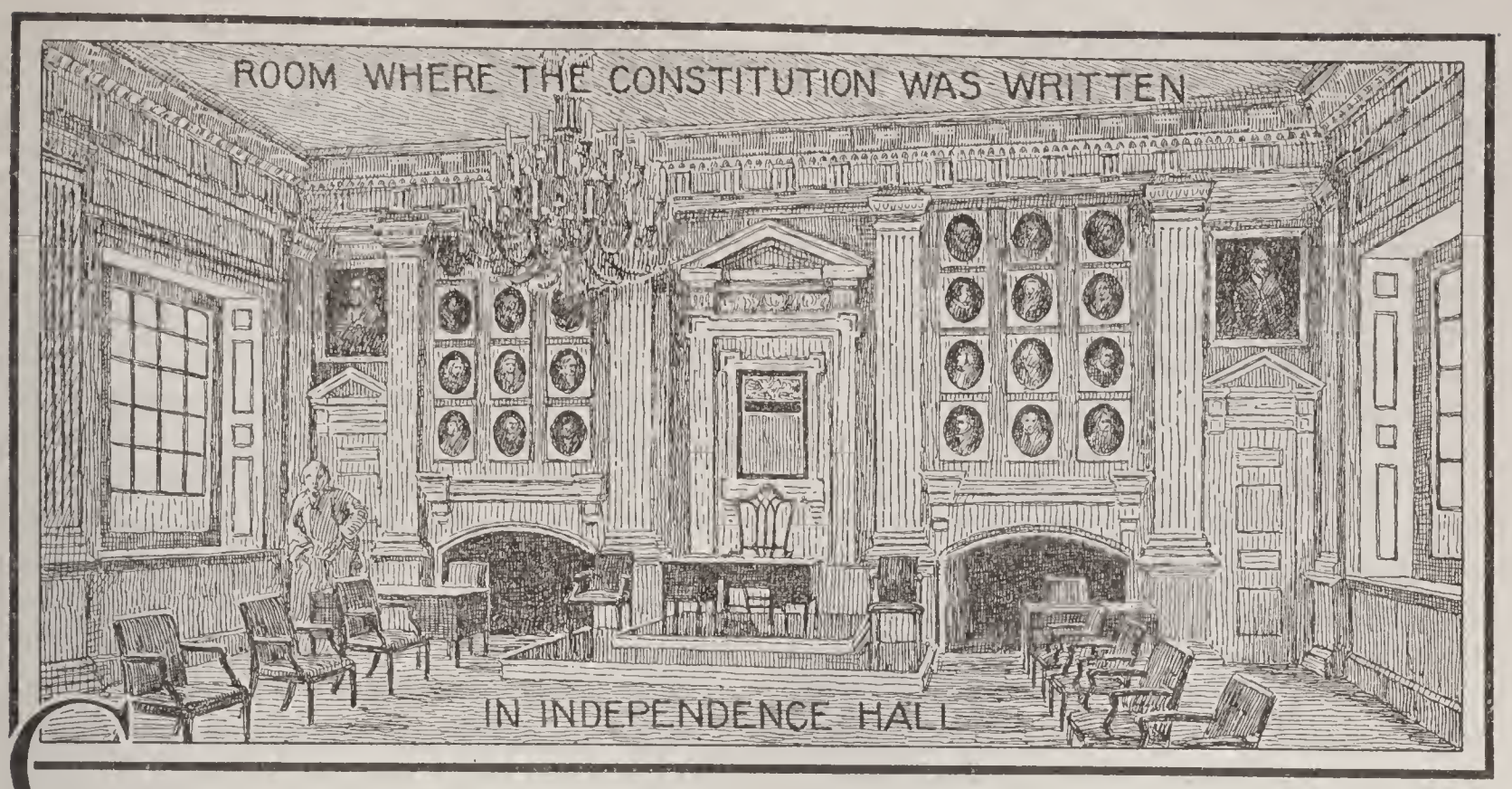
"Oh, better that her shattered hulk
Should sink beneath the wave;"

aroused public sentiment; the project was abandoned and the vessel was rebuilt in 1833. In 1855 it was put out of commission, but in

1877 was again partially rebuilt. In 1897, one hundred years after its launching, it was finally drydocked and repaired, to be preserved as a memorial of a proud period in history.

Ay, tear her tattered ensign down!
Long has it waved on high,
And many an eye has danced to see
That banner in the sky;
Beneath it rung the battle shout,
And burst the cannon's roar;—
The meteor of the ocean air
Shall sweep the clouds no more.
—HOLMES: *Old Ironsides.*

CONSTITU'TIONAL UNION PARTY, in United States history a party formed chiefly out of the remnant of the Whig party. It met in convention in Baltimore in May, 1860, and nominated John Bell of Tennessee for President and Edward Everett of Massachusetts for Vice-President, on a platform which declared only for "the Constitution of the country, the union of the states, and the enforcement of the laws." The party had only a scattering vote in the North, but in the South it carried the border states of Kentucky, Tennessee and Virginia and received a popular vote of about 600,000. The party virtually went out of existence after this campaign. See POLITICAL PARTIES IN THE UNITED STATES; BELL, JOHN; WHIG.



CONSTITUTION OF THE UNITED STATES, the basic or fundamental law of the republic. It is a precise, formal, written document of the *extraordinary,* or *supreme,* type of constitution. The founders of the Union established it as the highest governmental authority; there is no national power superior to it. Its foundations were so broadly laid as to provide for the expansion of national life and to make it an instrument which should endure for all time. To emphasize its stability, the framers made unusual and difficult the means by which it could be altered. No amendment becomes valid unless ratified by three-fourths of the states. The British constitution served, in some measure, as a pattern for it, but the wide variation required to meet the needs of a new sisterhood of states, all bound together as one federation, yet each sovereign in local affairs, developed a system of government unlike any the world had ever before seen.

Relation to State Constitutions. The Constitution binds the states of the American Union in a governmental unity in everything that affects the welfare of all, but recognizes the right of the people of each state to independence of action in what pertains solely to themselves. Therefore, the people of each state are allowed to formulate their local state constitution, but to avoid a conflict with the rights of other states or with the powers reserved to the Federal authority the national Constitution is declared to be the supreme law of the land, "anything in the Constitution or laws of any state to the contrary notwithstanding." This provision lessens the danger of a clash between Federal and state governments; for the decision in case of a conflict of laws is made a judicial, rather than a political, question. Since the Federal Constitution is the fundamental law of the land, all other laws must conform thereto; and the Constitution, like other laws, is enforceable in the courts. The Federal judiciary has jurisdiction over all cases arising under the Federal Constitution, laws and treaties; and therefore it has the final decision on all questions of constitutional interpretation. No other single provision of the Constitution has worked more successfully in practice, or received more praise from foreign critics.

If a law of Congress is passed which violates any provisions of the national Constitution the Supreme Court of the United States may declare it unconstitutional and void, provided the law is involved in a case before the court. In like manner, the supreme court of a state may set aside as unconstitutional any act of the state legislature which is in conflict with the state constitution.

History. Within a few months from the date the Articles of Confederation became effective (1781), serious defects were apparent in the system of government just established. There was a necessity for changes which would create a national government with adequate powers in place of the Confederation, which was in fact only a league of sovereign states. In 1786, an effort toward regulation of interstate commerce terminated in what is known as the Annapolis Convention. It was not possible to accomplish definite results at this meeting because only five states were repre-

sented. The debates made it plain that foreign and interstate commerce could not be regulated by a government so lacking in authority as the government of the Confederation, so Congress was asked to call a convention to provide a constitution of adequate scope. The response was prompt; Congress named Philadelphia, then the national capital, as the place of meeting, and appointed as the day the second Monday in May, 1787. The call was—

> " * * * for the sole and express purpose of revising the Articles of Confederation and reporting to Congress and the several Legislatures such alterations and provisions therein as should, when agreed to in Congress and confirmed by the States, render the Federal Constitution adequate to the exigencies of Government and the preservation of the Union."

The convention met under the Presidency of George Washington; sixty-five members were appointed by the states, but only fifty-five were able to attend. The task imposed was accomplished in the brief space of four months, and the Constitution as reported to Congress was declared nearly a hundred years later by the English Premier, Gladstone, to be "the most wonderful work ever struck off at a given time by the brain and purpose of man."

Difficulties beset the members at every turn. Radical differences of opinion were held by men strong and able to maintain themselves in debate. Several important compromises were written into the document as a result of conflicting views; possibly because they were compromises, people have looked upon them in late years as somewhat extreme precautionary measures. The first compromise related to the Presidency. Some desired strong, centralized, individual authority; others feared it. As decided, the President was clothed with great powers, but for a short term of office, while his power to make appointments and to conclude treaties can be exercised only with the consent of the Senate.

The second conflict was between large and small states, the former demanding power in proportion to their voting strength, the latter naturally opposing it. By agreement, the power of all states in the Senate was to be equal, but in the House of Representatives membership should be in proportion to population. The third compromise related to slavery; it was agreed that fugitive slaves should be delivered up by states to which they might flee for refuge, and that for twenty years (until 1808) no law should be passed prohibiting importation of slaves. Another subject on which middle ground was taken related to the manner of choosing the President. One element contended for election by direct vote of the people; another for choice by Congress. The latter element feared the ignorance of the people; the former feared the power of a small group of men in a matter of such vast importance. Out of the disagreement came the electoral college, the choice by the people of men called electors, who should be entrusted with the selection of the Chief Executive.

Outline of the Constitution. There are seven general divisions of the Constitution, called *articles;* each article is subdivided into sections, and each section into specific clauses. The general outline of subjects treated is as follows:

Article I. Organization of Legislative Department, and powers of Congress.

Article II. The Executive Department, powers and duties of the President, and manner of election.

Article III. The organization of the Judicial Department, and the extent of its powers.

Article IV. Powers granted to the states.

Article V. Method of amendment.

Article VI. Validity of contracts prior to adoption of the Constitution, the supremacy of the Constitution, and oath or affirmation required of officials.

Article VII. Ratification necessary to put the Constitution into effect.

Adoption of the Constitution. That the proceedings of the convention were not unanimous may be gathered from the fact that of fifty-five members present only thirty-nine signed the Constitution; sixteen either refused to sign or left before the instrument was fully completed. Article VII provided that the Constitution should be effective as the supreme law of the land as soon as ratified by nine states. Eventually the entire thirteen ratified it in the following order, by vote of conventions held in each state for the purpose of deciding whether the state should ratify or reject:

Delaware, Dec. 7, 1787; unanimously.
Pennsylvania, Dec. 12, 1787; vote, 46 to 23.
New Jersey, Dec. 18, 1787; unanimously.
Georgia, Jan. 2, 1788; unanimously.
Connecticut, Jan. 9, 1788; vote, 128 to 40.
Massachusetts, Feb. 6, 1788; vote, 187 to 168.
Maryland, April 28, 1788; vote, 63 to 12.
South Carolina, May 23, 1788; vote, 149 to 73.
New Hampshire, June 21, 1788; vote, 57 to 46.
Virginia, June 25, 1788; vote, 89 to 79.
New York, July 26, 1788; vote, 30 to 28.
North Carolina, Nov. 21, 1789; vote, 193 to 75.
Rhode Island, May 29, 1790; vote, 34 to 32.

Amendments to the Constitution. There would have been more prompt acceptance of

the Constitution by the states but for a conviction that the rights of the people had not been sufficiently safeguarded. It was only on the definite understanding that the first Congress would correct the omission by proposing amendments that several states voted to ratify it. The first ten amendments were accordingly proposed in 1789 and declared adopted in 1791. These comprise a Bill of Rights, guaranteeing the liberties of the individual, as well as the rights of the states, against Federal oppression. The eleventh amendment provides in effect that a state shall not be sued in the Federal courts by citizens of another state, or of a foreign country. This amendment was adopted in 1798. The twelfth amendment, changing the method of electing the President and Vice-President, was adopted in 1804. Thereafter, until the issues of the War of Secession were decided, no other amendments were proposed.

Amendments since the War of Secession. The reconstruction amendments (the thirteenth, fourteenth and fifteenth) were added to the Constitution in consequence of the War of Secession. The thirteenth amendment abolished slavery throughout the United States and all places subject to its jurisdiction. The fourteenth defines citizenship, and seeks to prevent the states from discriminating against certain classes of citizens. The fifteenth declares that the right of citizens of the United States to vote shall not be denied or abridged on account of race or color.

During the War of Secession the Federal government taxed incomes, but in 1895 the power of Congress to levy a similar tax was denied by the Supreme Court. A constitutional amendment was therefore necessary, in order that Congress might exercise this power. Accordingly, the sixteenth amendment was added to the Constitution in 1913, directly authorizing Congress to tax incomes.

The seventeenth amendment (adopted in 1913) provided for election of United States Senators by direct vote of the people. The eighteenth amendment (effective January 16, 1920) made the United States and all of its insular possessions prohibition territory. The nineteenth (effective August 26, 1920) gave suffrage to women.

Constitutional Changes through Interpretation. The Constitution has also been modified and expanded through interpretation, especially through the construction placed upon its terms by the United States Supreme Court. The importance of this tribunal in the development of the Federal Constitution can hardly be over-estimated. "The Constitution speaks of the age in which it was written, more than a century ago. The court expounds it in the language of its own age, holding fast to the old words and powers, but expanding them to keep pace with the expansion of our country, our people, our enterprises, industries, and civilization."

In the interpretation and expansion of the Constitution, the doctrine of implied powers has been of the utmost importance. The Supreme Court has uniformly held that the Federal government possesses not only the powers expressly granted in the Constitution, but also those which are included within, or necessarily implied from, powers expressly granted. In other words, where it appears that a power has been granted to the Federal government, the Constitution is to be liberally construed so as to give effect to the grant. This construction is authorized by the Constitution itself, which declares that Congress shall have power to make all laws which shall be "necessary and proper" for carrying into execution the powers conferred upon the Federal government. W.B.G.

Consult Bryce's *American Commonwealth;* Woodrow Wilson's *Congressional Government.*

Related Subjects. Further information bearing on this topic will be found in the following articles in these volumes:

Amendment
Annapolis Convention
Articles of Confederation
Congress of the United States
Courts
Representatives, House of
President of the United States
Senate of the United States
States' Rights
Supreme Court
United States
Subtitles *Government* and *History*

CONSUL, *kon'sul,* an official appointed by the government of one country to attend to its commercial interest in a city of another country. A consul differs from a diplomatic representative in that the former attends only to business matters, while the latter is interested only in the political relations between his country and the one to which he is appointed. Among the responsibilities resting upon the United States consuls are the issuing of certificates of births, deaths and marriages of Americans temporarily within their jurisdiction, regulation of shipping, caring for disabled seamen and the insuring of justice to native-born or naturalized American citizens who are traveling abroad. Consuls send to the home government reports concerning foreign trade conditions; this is one of the means by which they may be

helpful, for they can broaden the markets to home merchants. They give certification of invoices of merchandise valued at more than $100, which is exported; this duty is highly important for the protection of the customs revenue, as it is a check on smuggling.

The consular service of any leading country is divided into three ranks, *consuls-general, consuls* and *commercial agents,* the first named having charge of all consuls in a certain district; the last named, though they have the same duties and powers as consuls, are not officially recognized by the governments to which they are sent. In countries where the government is unstable, American consuls are invested with exceptional powers, and such powers and duties may be determined by treaty. Until recently, consular appointments by the United States have been governed wholly by politics. The folly of political recommendation alone has long been realized and consuls will soon be chosen for fitness and by competitive examinations. It is intended that any young man may in the future aspire to the consular service as a life occupation.

The Roman Consul. The title consul was bestowed on the two highest magistrates in the Roman Republic. These officials were first chosen in 509 B. C., the year in which the kings were expelled and the monarchy was abolished. Two consuls were elected every year, and at first only patricians were eligible to the office. Later the consulship was thrown open to the plebeians. The insignia of the consul were the purple-bordered toga, a staff of ivory, an ornamental chair, and twelve *lictors,* who preceded him bearing *fasces* and axes. In times of emergency the consuls received unlimited power, but their powers were not so extensive in the later days of the republic as at first. Under the emperors the office became merely honorary. E.D.F.

CONSUMPTION, *kon sump' shun* (IN ECONOMICS). A farmer in Ohio raises sheep and sells their wool to a manufacturer, who makes it into cloth. The manufacturer sells the cloth to a garment maker, who fashions some of it into a suit of clothes which he in turn sells to the clothing merchant; then the suit is purchased by the farmer who first sold the wool. Finally, the suit becomes so worn that it has to be cast aside. In the hands of the manufacturer the wool disappeared as wool, but reappeared as cloth. In the hands of the garment maker the cloth was made into garments, although it was still cloth, but the use to which the farmer put the suit caused the cloth to wear out, or to be consumed. This use of commodities to satisfy a human want is called *consumption* by political economists.

There are two kinds of consumption, called *productive* and *final.* In the illustration given above the usefulness of the material was increased with each change until it reached the farmer; therefore the manufacture of the wool into cloth and the cloth into clothing was *productive* consumption, but the wearing out of the suit by the farmer was *final* consumption.

The satisfying of human wants is the end of all consumption. However, in order that the highest aim may be realized it must be certain that a real need exists. There is a difference between consumption and destruction. The burning of wood for fuel is consumption, but burning it in a forest fire is destruction, since no need is satisfied. Food consumed by people or animals is final consumption, since it is not directly changed to more useful commodities, as in the above example of the farmer, the manufacturer and the tailor.

Laws which aim to control consumption by prescribing the dress and food which the members of different classes may use are known as *sumptuary* laws, and have, for the most part, become a thing of the past. Nevertheless, thinkers recognize that much consumption is wasteful or hurtful, and they agree that this is a matter on which ethics, and even laws, may have much to say. See ECONOMICS. W.F.R.

CONSUMPTION. See TUBERCULOSIS.

CONTEMPT', a wilful disregard or disobedience of a public authority, such as a court or legislative assembly, generally consisting in failure to obey its specific demands, or in insults. Contempts of court are of two kinds; the first are such as are committed in the presence of the court, which interrupt its proceedings, and the second consists of contempts arising from a refusal to comply with an order of court. Both are punishable by fines or by fines and imprisonment in the county jail, in the discretion of the court.

CONTINEN'TAL SYSTEM, a system of commercial blockade against England by Napoleon by which he sought to deprive the British Islands of all trade with the continent of Europe. This system began with Napoleon's famous Berlin Decree, November 21, 1806, which declared the British Islands in a state of blockade and prohibited all commerce and correspondence with them. Every Englishman

found in a country occupied by French troops was declared a prisoner of war; all merchandise belonging to the English was made lawful prize, and all trade in English goods was entirely prohibited. No ship coming from England or any English colony was allowed to enter any French port. England was not long in making reprisals, or retaliation. By a British Order in Council, January 7, 1807, all neutral vessels were prohibited from trading in any French port or in any country in alliance with France. France then directed the burning of all captured British goods. With the breaking up of Napoleon's power the system entirely collapsed. On the English side the enforcement of the Orders in Council gave offense to the United States and was one of the principal causes of the War of 1812. See BLOCKADE; WAR OF 1812.

CONTINUA'TION SCHOOLS. See SCHOOLS, subtitle *Special Schools.*

CONTRABAND, *kon'tra band,* in commerce, means *trade forbidden by law;* more directly, it includes goods that a neutral is prohibited by the laws of nations to furnish any country engaged in war, such as arms, ammunition, military or naval supplies, or anything which can be used in the manufacture of munitions of war. Even foodstuffs may be declared contraband, in which event the civilian population, as well as the army, may be made to suffer. Unless there are special treaties defining exactly what articles are contraband of war, the interpretation of this law often leads to much embarrassment. According to current practice contraband of war is of two classes, *absolute* contraband and *conditional* contraband, the latter consisting of articles which are fit for but not directly necessary to hostile uses.

Another law, insisted on by England during the wars with Napoleon, is that each belligerent shall have a right to visit and examine neutral ships to ascertain whether they carry any contraband of war which seems likely to be intended for the enemy. During the War of the Nations in 1915 England declared cotton to be contraband, as its enemy, Germany, used that important product in the manufacture of explosives. A neutral country should be able to carry on ordinary trade with people in any of the belligerent nations, except when prevented by blockade (which see).

CONTRACT, *kon'trakt,* an agreement between two or more persons, whereby each of the contracting parties binds himself to do or not to do a particular thing. Such an obligation is created and determined solely by the will of the parties; the business of the law is to give effect, as far as possible, to their plain intention. All rules of the interpretation of contracts are based on this fundamental principle, and no government may in any way modify a legal agreement. The making of a contract involves two distinct acts; the making of an offer and the accepting of the offer. Contracts may be verbal or written, but contracts to run for longer than a year must always be in writing.

Classification of Contracts. Contracts have been divided into various groups under the law, but for general purposes they may be classified as *express* and *implied.* Express contracts are those in which the provisions are clearly stated (expressed) in the contract at the time it is made. Implied contracts are those in which some of the things to be done are not specified but are left to the understanding of the parties. In case of a dispute the provisions of an implied agreement are determined by circumstantial evidence, showing what the parties intended to contract.

Requirements of a Legal Contract. A contract to be legal must fulfil the following requirements:

(*a*) It must be made by competent parties. Since the violation of a contract makes the offender liable to the payment of damages, it is important that only responsible persons be permitted to enter into such agreements. A lunatic or an idiot or a person so under the influence of intoxicants as to be unable to exercise his free will, cannot enter into a contract which the law will uphold. Under the common law a contract made by a married woman is also void, but this disqualification has been removed by statute in many countries. The contract of a person under the age of twenty-one (legally an *infant*) is not binding upon him, unless it be for something that is necessary to life or intended to promote his education. However, a minor's contract binds an adult with whom he may enter into an agreement. The minor may sue, but cannot be sued upon his contract, and he may repudiate or affirm such contract when he becomes of legal age. Contracts are also illegal and void if made between citizens of two countries which are at war.

(*b*) For an agreement to be legally binding the assent to its terms must be real. That is, the minds of both parties must be in accord. A contract obtained by compulsion, fraud, misrepresentation or through a clearly-proved mistake on the part of the contracting parties cannot be enforced.

(*c*) The thing which the persons entering into the agreement contract to do must be lawful. Betting and gambling agreements, contracts in which illegal rates of interest are imposed, and agreements in restraint of trade are void. An agreement in restraint of trade is one that tends

to interfere with the right of either party to engage in a particular business. For example, A may sell his grocery store to B and agree in writing never to engage in the grocery business again in the same state. Such a contract is not legal, for it prevents A from engaging in a legitimate business which would not interfere with B's success. But if A contracted to refrain from starting a grocery store in the same town for a period of ten years the agreement would be lawful.

(*d*) To constitute a contract the agreement must provide for a consideration or its equivalent. That is, if A promises to do something for B for nothing there is no contract, for B has not bound himself to give anything in return. The law in such a case will not compel A to abide by his promise. As to the adequacy of the consideration, that matter is left to the judgment of the contracting parties. However, where the rights of creditors of either party are involved, gross inadequacy of consideration may be grounds for contesting the contract.

Discharge of Contracts. When the obligations of an agreement have been fulfilled the contract is said to be discharged. The ordinary method of discharge is the performance of the things agreed upon to be done. In some cases the words "to perform to the other's satisfaction" are inserted, but one should be cautious about signing such an agreement. If one of the contracting parties is unscrupulous he may use such a condition as an excuse for avoiding just payment. As a contract usually calls for the performance of certain acts by both parties, one party cannot demand performance of the other unless he himself has fulfilled his obligations. If a contract is broken and damages are liable to result, the parties may agree upon the sum to which the injured person is entitled as compensation, but if such an agreement cannot be reached there may be an appeal to the courts.

If one party to a contract wilfully alters the instrument so as to change the effect of the agreement, the other party is relieved from his obligation. Tampering with a paper by a third party, however, called *spoliation,* has no effect on the original agreement. Contracting parties may by mutual consent agree to terminate a contract. Death of a party, except where his contract was for personal services, does not terminate the agreement, as the heirs may be held. A.E.R.

CON'VICT LA'BOR, the system introduced into prison life by which prisoners are employed in some form of useful work. Such employment of convicts is a development of the nineteenth century, for in former periods idleness in prisons was the rule. In all penal institutions work is now considered necessary for the welfare of the prisoners and to help pay the expenses of maintenance; the former reason is the more vital. A distinct effort is now made to furnish the convict with work of a constructive nature, the old scheme of assigning menial tasks alone having been done away with.

There are two methods of convict labor. The first looks to profits from the labor, which is shared by the state with private individuals or firms. This method is subdivided into three divisions, the *contract,* the *lease* and *piece-price* systems. Under the lease system the convicts are leased to a contractor for a fixed price and a definite time. Under the contract system any firm may purchase the labor of a specified number of convicts; it provides that the work shall be done within the prison walls but under direction of the contractor, the latter furnishing the raw material and paying a stated amount for the labor. The convict usually receives no income. In the piece-price system the officials oversee the work.

In many of the states, what is known as the *state use system* is growing, and has been authorized by the Federal government for the Fort Leavenworth penitentiary. All materials are provided by the state, and state officials supervise the work. The profits are turned over to the public funds. Products are sold in the open market, or, as in New York state, only such articles may be made as will be utilized in other public institutions. This plan, however, does not avoid competition with free labor, and it is sometimes provided that convicts shall receive a small wage for each day employed. For example, Minnesota pays its convicts from 17 cents to $1.50 per day for the labor they perform, and this costs the state $80,000 per year. The investment appears to be profitable from every point of view, for the penitentiary earns the state yearly profits as high as $275,000.

Men studying prison reform questions now advocate manual and technical training, especially for the younger men. Among the latest advances in prison life is the honor system outside of prison walls, which has been found to work well in the states of Colorado, North Dakota and Oregon. This method is also a feature of discipline in Illinois on the prison farm, where convicts are employed and placed on honor. For treatment of prisoners in penitentiaries, see the article PRISON, subhead *Prison Reform.* A.E.R.

CONVOLVULUS, *kon vol' vu lus,* a genus of slender, twining or trailing herbs with milky juice, bearing trumpet-shaped flowers. The name comes from the Latin, meaning to *roll around* or *twine,* and was suggested by the habits of these herbs. Some species are common weeds; others are cultivated in gardens for their beauty, and still others have strong medicinal properties. The growth of all must be watched, however, for if they reach out and twine on other plants, the latter will be suffocated and die.

Related Subjects. This topic should be read in connection with the following articles in these volumes:

Bindweed	Moonflower
Botany	Morning-Glory
Dodder	Scammony
Jalap	Sweet Potato

CONWAY, Hugh. See Fargus, Frederick John.

CONWAY CABAL'. See Cabal, subhead.

COOK, Frederick Albert (1865-), an American physician and explorer who, on returning from the Arctic regions in September, 1909, thrilled the world with the announcement that on April 28, 1908, he had discovered the North Pole. Previous to this he had accompanied Peary as surgeon on his Arctic expedition of 1891-1892, and had performed like service in 1897-1899 for the Belgian Antarctic expedition. In 1906 he and a companion ascended Mount McKinley, Alaska, and Cook claimed that they reached the summit; later, the claim was disputed.

When he first returned from his "dash to the Pole" he was received with extraordinary enthusiasm at Copenhagen, Denmark, and in America, where his lectures attracted large and interested audiences. Nobody at first questioned his right to the honors showered upon him, for it was known he was a veteran polar traveler, who possessed such knowledge of the high latitudes as would make possible the feat he claimed to have accomplished. However, scientists soon began to express doubts as to the truth of his story, and when Peary returned from his Polar expedition, in September, 1909, with reasonable proofs of his own discovery of the Pole, it was generally believed that Cook was mistaken. Finally, after a thorough investigation, the learned scientists at Denmark announced that the proofs submitted by Cook were not sufficient. He continued his lectures, however, and many who heard him were convinced of his sincerity. While very few believe he accomplished the trip to the Pole, there is a very general tendency to concede Cook's own honest belief that he had done so.

His writings, in addition to several magazine articles, include *My Attainment of the Pole, To the Top of the Continent* and *North Pole and Bradley Land* (with E. S. Balch). See Peary, Robert E.; Polar Exploration.

COOK, James (1728-1779), one of the most famous navigators of all time, who devoted his life to exploration and practically changed the map of the world. He entered the British navy in 1755, and his first valuable service included a thorough survey of the Saint Lawrence River and the Newfoundland coast. Next he was heard of in command of a scientific expedition to the Pacific Ocean, during which he visited New Zealand, discovered New South Wales and returned to England by rounding the Cape of Good Hope in 1771. A year later he set out again and added greatly to his discoveries. Another expedition followed, during which he explored Cook Inlet in Alaska in a vain attempt to discover a near route to the Arctic Ocean. His rediscovery of the Sandwich Islands (now Hawaiian Islands) led to his death. Venturing ashore to demand restoration of a stolen boat, he attempted to seize the native chief and hold him as a hostage. A fight ensued in which he was killed. His wife and children were pensioned by the British government, and it was declared that high honors would have been bestowed on him had he safely returned to England.

COOKE, Jay (1821-1905), a famous American financier who rendered invaluable service to the United States during the War of Secession as the chief financial agent of the government. All of the great war loans, together reaching a total of $2,000,000,000, were negotiated by him. He was born in Sandusky, Ohio, and began his career in 1838 as a clerk in the banking house of E. W. Clarke & Co. of Philadelphia. Four years later he became a junior member of the firm, and in 1861 established in Philadelphia the famous banking house of Jay Cooke & Co. The national banking system organized during the war had his warm approval, and he was helpful in popularizing it. In 1873 his great banking company failed as a result of investing too heavily in Northern Pacific Railroad stock, a failure that helped to bring on the financial panic of that year. Cooke later built up another fortune, partly by investing in Western lands, and all claims against him were paid.

COOKERY, *kook'er i,* the art of making food attractive, savory and appetizing by various methods, most of which involve heat. The most important of these methods are boiling, steaming, roasting, broiling, frying and baking. Just when man discovered that his food tasted better cooked than raw is not known, but it may have come about in some such way as Charles Lamb describes in his *Dissertation on Roast Pig.*

Bo-bo, a little Chinese boy, accidentally set fire to his father's house and burned up several little pigs that were kept in it. On feeling of one of the sizzling bodies to see if it had any life remaining, he burnt his fingers, and of course thrust them in his mouth. To his astonishment he found that the juicy pieces which stuck to his fingers were the most delicious food he had ever tasted, and as a result of his adventure, roast pig and the knowledge of roasting became common throughout China.

This fanciful little story suggests one reason for cooking. Cooking not only develops flavor, but makes many foods, especially meat, more attractive in appearance, thereby stimulating the appetite and aiding digestion by increasing the flow of the digestive juices. Cooking kills harmful microbes that are a source of disease, and it also brings about chemical and physical changes in the food, such as the softening of connective tissue in meat, and the changing of starch into a gummy substance known as dextrin (which see). These physical and chemical changes make it easier to masticate and digest the food.

What a man eats is so intimately connected with his health and happiness that the preparation of foods bears a direct relation to the prosperity and welfare of the nation; therefore cooking is becoming more and more recognized as a science. As a result, courses in cooking are being quite generally introduced into the public schools. Pupils in cooking classes are not only taught how to prepare the various foods, but they also learn that foods vary in their nutritive value, and that this value depends upon their chemical composition. Every person whose duty it is to prepare meals should understand the comparative nourishing qualities of the foods in common use. Correct information on this subject may be obtained by writing to the government Department of Agriculture. S.L.A.

Time Tables. The following tables show the time required for cooking most of the staple foods:

Time Required for Roasting or Baking Meats and Fish

Beef, ribs or loin, rare, per pound	8 to 10 minutes
Beef, ribs or loin, well done, per pound	12 to 16 minutes
Mutton, leg, rare, per pound	10 minutes
Mutton, leg, well done, per pound	14 minutes
Lamb, well done, per pound	15 to 18 minutes
Veal, well done, per pound	18 to 20 minutes
Pork, well done, per pound	20 minutes
Chicken, per pound	15 or more minutes
Turkey, 8 to 10 pounds	3 hours
Goose, 8 to 10 pounds	2 hours or more
Duck (domestic)	1 hour or more
Duck (wild)	15 to 30 minutes
Pigeons (potted or en casserole)	2 to 4 hours
Ham	4 to 6 hours
Fish, whole, as bluefish, salmon, etc.	1 hour or more
Small fish and fillets	20 to 30 minutes
Baked beans with pork	6 to 8 hours

Do not season with salt until the meats are nearly done, as salt draws out the juices and toughens the fiber, making the meat dry and tasteless.

Broiling

Steak, 1 inch thick	4 to 10 minutes
Steak, 1½ inches thick	8 to 15 minutes
Lamb or mutton chops	6 to 10 minutes
Squabs	10 to 12 minutes
Spring chicken	20 minutes
Shad, bluefish, etc.	15 to 20 minutes
Small fish, trout, etc.	5 to 12 minutes

Frying

Whitebait, croquettes, fish balls	1 minute
Muffins, fritters and doughnuts	3 to 5 minutes
Breaded chops	5 to 8 minutes
Smelts, brook trout, etc.	3 to 5 minutes

Boiling Meat and Fish

Braised meats	3 to 5 hours
Fresh beef	4 to 6 hours
Corned beef (rib or flank)	4 to 7 hours
Corned tongue	3 to 4 hours
Leg or shoulder of mutton	3½ to 5 hours

WORLD BOOK

CALVIN COOLIDGE. Became a national figure as Governor of Massachusetts. Elected Vice-President of the United States in 1920.

Leg or shoulder of lamb	2 to 3 hours
Turkey, per pound	15 to 18 minutes
Chicken, 3 pounds	1 to 1½ hours
Ham	4 to 6 hours
Lobster	25 to 30 minutes
Codfish and haddock, per pound.	6 minutes
Halibut, whole or thick piece, per pound	15 minutes
Bluefish, bass, etc., per pound...	10 minutes
Salmon, whole or thick cut	10 to 15 minutes
Small fish	6 to 8 minutes
Clams and oysters	3 to 5 minutes

Green Vegetables

Green peas, young and fresh	15 minutes
Green peas, old and not fresh	30 minutes
String beans	45 minutes
Beans, shelled (green)	45 minutes
Lima beans, young, fresh	30 minutes
Lima beans, dried (soaked)	45 minutes
Cabbage, whole head, simmer	2 hours
Cabbage, half head	1 hour
Cabbage, chopped	20 minutes
Cucumbers, cut into quarters	30 minutes
Squash, pared and cut into blocks	20 minutes
Pumpkin, in squares for pies	30 minutes
Tomatoes, peeled and stewed	30 minutes
Tomatoes, baked, whole, slow oven	1 hour
Tomatoes, stuffed and baked	1 hour
Onions, new	45 minutes
Celery, stewed	30 minutes
Spinach	10 minutes
Brussels sprouts, fresh	30 minutes

In cooking underground vegetables use boiling, unsalted water to start, adding salt when they are partly cooked.

Dry and Underground Vegetables

Potatoes, to boil until they can be easily pierced to center with a fork	30 minutes
Potatoes, to bake, slowly	45 minutes
Potatoes, cut into cubes, to cream	10 minutes
Beans, soup, dried, soaked over night, slowly	2 hours
Peas, dried, soaked over night	2 hours
Sweet potatoes, medium size, to boil	40 minutes
Sweet potatoes, medium size, to bake.	45 to 50 minutes
Turnips, white, cut into blocks to stew.	20 minutes
Turnips, yellow, cut into blocks, to stew	30 minutes
Carrots, cut into cubes, to stew	1 hour
Parsnips, cut into halves	1 hour
Beets, new	45 minutes
Beets, old	4 hours
Asparagus	45 minutes
Green sweet corn, after it begins to boil	5 minutes

Oven Temperature and Time Required to Bake Bread, Cake and Pastry

Bread (in small French loaves)	at 340° for 30 minutes
Bread (square loaves) and for 50 minutes at 240°	at 280° for 30 minutes
Corn bread (in shallow pans)	at 340° for 45 minutes
Pies, with upper crust	at 340° for 30 minutes
Pies, with under crust	at 320° for 30 minutes
Patties and tarts	at 340° for 20 minutes
Muffins and gems	at 340° for 20 minutes

COOLIDGE, Calvin S. (1872-), Vice-President of the United States, inaugurated March 4, 1921. He was born on July 4, at Plymouth, Vt., was graduated at Amherst College in 1895, and studied law in Northampton, Mass., in which city he thereafter made his home and where he married in 1905 Miss Grace A. Goodhue. Coolidge prospered in the law and became a local bank president. His inclination was towards public life. He filled successively the offices of member of the city council (1899), city attorney, and clerk of court; in 1912 he was elected to the state senate, where he served four years, the last two as its president. Then for three years he was lieutenant-governor, and on the record there made was elected governor of the state; he held this office during 1919 and 1920. In this high post he won the hearty approval of the people of the United States by his determined stand in defense of Boston against a strike of city policemen. The principle was then clearly established that servants of the public, in any capacity, must not by mass action endanger public welfare. At the Republican national convention in 1920 there was much sentiment favoring Coolidge for President. On the tenth ballot Harding won first honor, and Coolidge was unanimously nominated for the Vice-Presidency.

COOPER, *koop'er,* James Fenimore (1789-1851), often called the "American Scott," author of that stirring series of stories of frontier life, the *Leather Stocking Tales;* also the first American novelist to gain a reputation in Europe. He was born in Burlington, N. J., but when he was a year old his Quaker parents moved their family of twelve to Otsego Lake, where they started the town of Cooperstown, N. Y. It was there, surrounded by forests and in daily contact with the red men, that Cooper spent his early life; indelible impressions were here obtained which later furnished much material for his tales of the forest.

JAMES FENIMORE COOPER

The discoverer of a vast new region of romance, and the most successful worker in that field.

Although Cooper studied at Yale, he was not a close student and in his third year was asked to leave the college. He then joined the United States navy, and the knowledge and experience gained during that service make his later sea tales realistic. He married and retired from the navy just before the War of 1812. Settling at Cooperstown, he engaged in farming. One day, when reading aloud an English novel, he boasted to his wife that he could write a better novel than many of those appearing at that time. So he produced *Precaution,* a commonplace story of English high life, of which Cooper knew nothing. Advised to turn to adventure in his own country, he wrote *The Spy* in 1821 and published it at his own expense. On its appearance he was at once recognized as a novelist of force.

In the twenty years that followed he brought out many novels, including those stirring sea tales, *The Pilot* and *The Red Rover;* also those books so popular with boys, and even girls, and retained as pleasant memories in the minds of adults, the *Deerslayer, The Last of the Mohicans,* by many considered the best of the series, *The Pathfinder, The Pioneer* and *The Prairie.*

Although some have said that Cooper's Indians were idealized and his characters not real, and although his style is somewhat careless, he will nevertheless live in history as one of the greatest American writers, and as the creator of a few characters which are worthy a lasting place among characters of fiction—"Harvey Birch" in *The Spy;* "Natty Bumppo," the backwoodsman; "Long Tom Coffin," and "Uncas," the Indian. Cooper's works have been translated into many languages, and places around Otsego Lake are still pointed out to visitors as spots he invested with literary interest. M.S.

Consult Brownell's *American Prose Masters;* Phillips's *James Fenimore Cooper;* Lounsbury's *Life of Cooper.*

COOPER, Peter (1791-1883), a self-made American inventor, manufacturer and philanthropist, whose successful career affords a splendid example of what may be accomplished by industry and perseverance. When Peter was a small child the Cooper family removed from New York City, where he was born, to Peekskill. There he lived until he was seventeen, receiving only a meager schooling, but developing his mechanical genius in every possible way.

In 1808 he became an apprentice to a coachbuilder in New York, at a salary of $25 a year and his board. During his four years of service he not only learned the trade but made several useful inventions, including a machine for mortising hubs. Later he began the manufacture of a machine for shearing cloth, turned from that to furniture-making, started a grocery business of his own, all the time making money; at the age of thirty-three he laid the foundation of a great fortune by his purchase of a glue factory. Cooper's inventiveness, energy and good sense gave him a practical monopoly of the country's trade in glue and isinglass for half a century.

PETER COOPER

In 1830 he was engaged in the manufacture of charcoal iron near Baltimore, and in the same year constructed from his own designs one of the first steam locomotives ever made in the world, the famous *Tom Thumb.* Soon after this he sold his iron works in Baltimore and built an iron factory in New York, which he afterwards turned into a rolling mill. In 1845 he removed his business to Trenton, N. J., and built there a new rolling mill, then the largest in the United States, in which were manufactured the first rolled-iron beams for buildings. In 1879 the Iron and Steel Institute of Great Britain fittingly acknowledged Peter Cooper's services in developing the American iron trade by awarding him the Bessemer gold medal.

Cooper believed that the great fortune which he built up should be used, to quote his own words, "for the benefit of his fellow men." It was this ideal which inspired him to lend his influence and give financial support to the movement for the laying of the Atlantic cable, and his liberality has another permanent memorial in the great Cooper Union in New York City (see below). During the financial disturbance following the panic of 1873 he became deeply interested in the Greenback movement, and in 1876 was nominated for the Presidency by the Greenback party.

Cooper Union, established by Cooper in 1859, is an institution where the working classes of

New York City may enjoy educational advantages by means of day and evening classes, lectures, reading rooms and art and scientific collections. There are courses in technical science and art, stenography, typewriting and telegraphy, decoration and architecture, eloquence, oratory and debating; degrees are given in civil, electrical and mechanical engineering. The building, erected at a cost of $630,000, is located at the densely-populated point where the Bowery divides into Third and Fourth avenues. Additional gifts since the establishment of the Union, including $600,000 from Andrew Carnegie, have brought the endowment to over $2,000,000. B.M.W.

COÖPERATION, *ko op er a' shun.* When the first crude savages learned that two men working together could lift a stone which one man alone could scarcely move, industrial coöperation began. But so firmly has mankind held to the distinction "mine and thine," and to the idea that the only way to make *mine* greater is to make *thine* less, that joint labor for mutual benefit has until very recently been classed among the schemes that sound well but are not practical, beyond very narrow limits. In the last year of the eighteenth century Robert Owen, a British factory owner whose story is told in these volumes, began experiments which proved it profitable for an employer to regard his men as fellow-workers; since his time coöperation has been successfully introduced into the industrial world in many forms. In general, the word *coöperative* is limited to democratic organizations for mutual advantage in buying, in selling, in borrowing and in producing, but the coöperative spirit is evident in many other present-day activities and is the basis of public ownership of railroads and other public utilities.

Coöperative Buying. One December day in 1844 the dwellers in Toad Lane in the city of Rochdale, England, witnessed the quiet opening of a modest little store whose stock of foodstuffs had been purchased with subscriptions of a few cents from each of its owners. To-day a visitor to Great Britain will find 1,500 stores, ranging in size from the smallest of shops to those which do a business of a million dollars a month, together operating an enormous wholesale society, several factories, farms, plantations in the tropics and a fleet of ocean-going steamships—all owned by the people who buy the goods and all the result of the venture in Toad Lane.

The Rochdale plan, almost exactly as outlined by its founders, is the guide not only for the British stores but also for a few hundred stores in the United States and Canada and thousands in other countries. Its distinctive features are that no member can hold more than one share of capital and that dividends are paid in proportion to the value of goods purchased, not the amount invested. In England one share of capital is worth five pounds, but to join one needs to pay but a shilling. At the end of the year this stockholder receives interest on his share, and if he has spent a hundred pounds at the store he will be given back perhaps six pounds of it. At first this will be applied to the sum owed on his five-pound share, but afterward it comes in cash and so reduces the cost of living.

Coöperative Selling. No other country has applied the principle of coöperation so extensively as Denmark. In this land of prosperous small farmers it would be difficult to find a farmer who is not a member of at least one coöperative society. The coöperative dairies export more butter than all the dairies in any other country, and return profits to each farmer in proportion to the value of the milk he contributes. The Londoner at his breakfast may have fruit, fresh eggs and bacon, beet sugar and honey, all with their quality certified by Danish coöperative societies. In a little more than thirty years coöperation has transformed Denmark from a poor nation to one of individuals uniformly prosperous.

On a smaller scale other countries have met with success in coöperative selling of farm products. Not many years ago the fruit growers of California were unable to get the full value of their crops because of the profits taken by the *middleman*—the person who bought their fruit and marketed it in the East. To-day, through coöperation, the growers themselves get these profits, and the fruit comes to the public in better condition than before. The farmers of the grain belt had a similar experience. Now farmers in the United States have several thousand coöperative elevator societies (though in 1911 there were only 300), and grain growers in Saskatchewan and Alberta are organized into strong and profitable provincial associations. These are but two of many such instances.

Coöperative Banking. If a man of small means needs to borrow money he will find it difficult, but if several men join together the affair is made easy. Similarly, a man with a small amount of money to invest is at a dis-

advantage unless he joins with his neighbors. These are the two maxims upon which the extensive credit coöperation of Germany is based, the system which has been copied by all the countries of Europe and recently by the United States (see RURAL CREDITS). They are the basis, too, of the building and loan societies which in Canada and the United States make it possible for thousands of families to own their homes.

American Backwardness. Though there are no reliable figures of coöperation in the United States and Canada, this table of the numbers in each country who are members of coöperative societies gives the situation in a general way:

Denmark	1 in 4
Switzerland	1 in 10
Austria, Germany, Rumania	1 in 13
Belgium, Finland	1 in 15
Netherlands, Russia, Great Britain	1 in 16
Japan	1 in 100
Canada	1 in 300
United States	1 in 1,000

Several European countries have been omitted in which the proportion of coöperative members is less than one in sixteen; all but Albania, Greece, Portugal and Turkey excel the United States. C.H.H.

COOP'ER'S CREEK, an Australian river formed by the junction of the Thompson and Barcos rivers, rising in Queensland and flowing southwest through South Australia into Lake Eyre. In the rainy season it is a rushing torrent two miles wide, but in times of drought many portions are completely dry. In 1861 the explorers Burke and Wills died from starvation on the banks of this stream.

COOSA, *koo'sa,* **RIVER,** a river of Georgia which unites with the Tallapoosa to form the Alabama. The Coosa itself is formed by the junction of the Etowah and the Oostanaula, in Floyd County. The united streams flow for a distance of about 350 miles. Part of the Coosa is navigable for small steamers which carry local commerce, and it drains an area of about 10,000 square miles.

COOT, *koot,* or **MUD HEN,** a water bird of the rail family, different species of which are common throughout America and in most parts of Europe, Asia and North Africa. To "come from haunts of coot and hern," like Tennyson's *Brook,* would mean from marshy lakes or quiet, weedy rivers, for it is among the reeds that the coot nests and dives for its food of snails, seeds, fish eggs and vegetable matter. Though worthless for food, the coot is often shot by hunters. It is about fifteen inches long, usually dark slate-colored, sometimes mottled with white. Unlike the true rails, the toes, instead of being webbed, are edged with a peculiar greenish, scalloped membrane. The bill is strong and straight, extending up the forehead and ending in a naked patch. Differing from the coot of Europe, the bill of the American coot is white. This unattractive bird is shy and hides in weeds and grasses when alarmed, and though awkward on land, it is a graceful diver.

THE COOT

COPENHAGEN, *ko pen ha'gen,* the capital and largest city of Denmark. It is situated on the lower end of the island of Zealand, which lies on the eastern coast, at the west end of the Baltic Sea. A southern portion of the town lies on the adjacent coast of the island of Amager. These islands are separated by a strait which serves as a harbor, and which is crossed by two bridges. Copenhagen is the commercial center of Denmark, being the outlet for over half its exports; steamship lines connect with England, Russia, Germany and Sweden. It lies in the same latitude as Moscow, in Russia, and as cold Hopedale in Labrador, but the climate is greatly tempered by the Gulf Stream, which enters the North Sea.

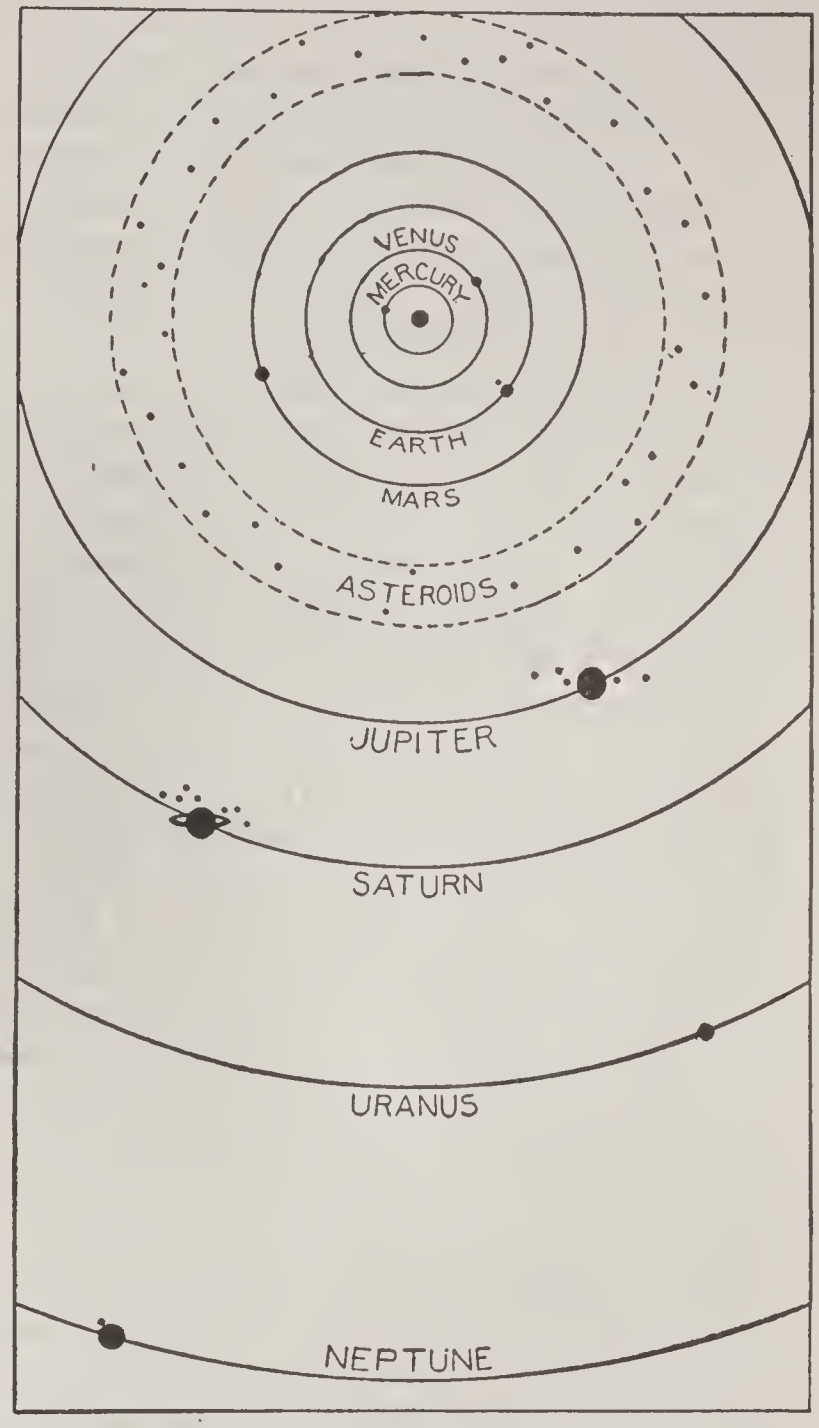
Copenhagen, one of Europe's most beautiful cities, contains many interesting and notable places, some of them centuries old. Among its quaintest features are the old gabled houses which line the quay of Nyhavn; another is the spire of the Exchange (Borsen), which was built early in the seventeenth century (1619-1640); this is formed of four great dragons whose heads point in the directions of the compass, while their bodies intertwine until their tails form the top of the spire. Two of

the most notable churches are the metropolitan cathedral, or Vor Frue Kirke, and the Frederiks Kirke or Marble Church, begun by Frederick V in 1740. The former contains sixteen magnificent statues executed by Thorwaldsen, one of the world's greatest sculptors, and the other is noted for its great dome, which lacks only a few feet of being as large as Saint Peter's at Rome. In the Thorwaldsen Museum are more than 300 of the sculptor's works, which he bequeathed to his native city, and here also is his tomb. The Prinsens Palais, once a royal residence, but now a national museum, contains one of the finest ethnological collections in the world.. The University of Copenhagen, founded by Christian I in 1478, is one of the oldest in Northern Europe. In the Royal Library are 540,000 volumes and 20,000 manuscripts. The city is the chief center of Scandinavian literature, art and science.

History. The history of Denmark was once little more than the history of the city; it dates back to 1043, when it was only a fishing village, remaining unimportant until the middle of the twelfth century. As there was a good harbor, the village soon attracted many merchants and was called *Kaupmannahöfn,* or *merchant's harbor,* to which may be traced the present name. It did not become the royal residence and capital until 1443. During the centuries following, the city withstood several sieges. In 1658-1660 it held out against that noted warrior Charles X of Sweden and saved the country from conquest. In 1807 it was bombarded by the English and part of the city was destroyed by fire. In 1921 its population was 561,344; with suburbs, 666,159.

COPERNICUS, *ko pur' ni kus,* NICHOLAS (1473-1543), a great astronomer of the sixteenth century, who announced the discovery that the sun is the center of the universe. He therefore gave to the world the basis of modern astronomy. Copernicus was born in Poland. After spending several years in the study of medicine he devoted himself to mathematics, toward which he had a natural leaning. The study of astronomy soon enthralled him, and he taught mathematics with great success. In 1505 he left Rome, where much of his fame had been gained, and returned to his native country and entered into Holy Orders, becoming a canon in the Cathedral of Frauenburg, an office he held until his death.

Previous astronomers had held to the Ptolemaic principle that the earth was the center of the universe. Copernicus doubted the correctness of this conclusion, and his observations confirmed his doubts. His discoveries were not at once given to the world, however. He feared the criticism and hostility of the Church, for a hint of his discoveries



THE COPERNICAN SYSTEM

It was Copernicus who declared the sun (the heavy inner dot) to be the center of the solar system, and showed that the planets revolve around it. Distances as compared on the above chart are not correct, and cannot be made so; the reason is given in the article ASTRONOMY.

had brought forth the accusation that he was proceeding in a task that was opposed to the Scriptures. When his great work appeared explaining his theories and discoveries, it was dedicated to the Pope, in the hope of gaining the sanction of the Church. The attitude of the Pope, however, did not affect the astronomer. A few hours after receiving a copy of his publication Copernicus died, without realizing that he had achieved imperishable fame. See PTOLEMY; ASTRONOMY.

COPLEY, *kop' li,* JOHN SINGLETON (1737-1815), one of the most illustrious of the early American painters. He was born in Boston,

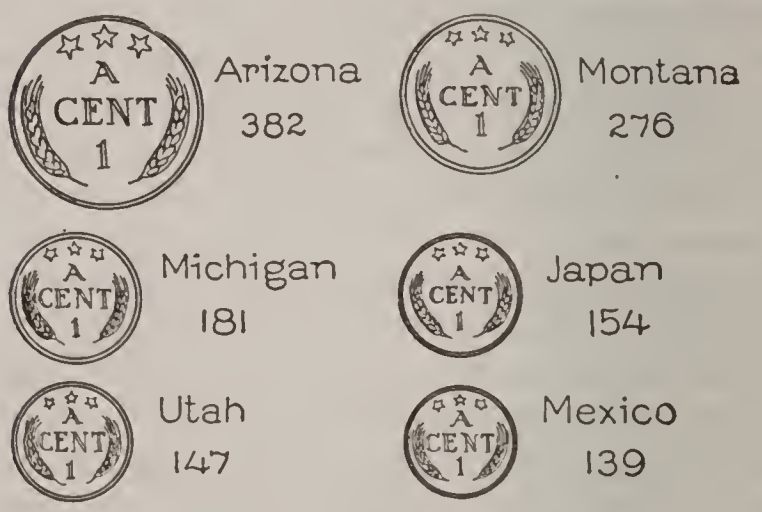
of Irish parentage, and studied under Peter Pelham, a well-known painter and engraver. Copley gained a reputation by painting portraits of the aristocrats of colonial society, many of which are highly prized by their descendants of to-day because of their rich coloring and dignified and distinguished treatment. His portrait of Mrs. Thomas Boylston, in the Memorial Hall of Harvard University, and that of Mary Storer, in the Metropolitan Museum of New York, represent the highest types of portraiture. After 1775 he lived in London, where he began a series of celebrated historical paintings. Among these are the *Death of Lord Chatham* and the *Repulse of the Spanish Batteries at Gibraltar.* In 1783 Copley was elected to the Royal Academy.

COPPER, *kop'er.* Many centuries ago the Greeks and Romans obtained a red metal from what is now the Island of Cyprus in the Mediterranean Sea. The Romans called this metal *cyprium,* a word derived from *Kypros,* the Greek name of the island. In later Latin the word became *cuprum,* and the English name for the metal is only another variation of the same word. Almost everyone is familiar with copper in some form or another. It is used for the bottoms of wash boilers, for tea kettles, and various other household utensils. Copper wire is a common article of commerce, and copper nails and tacks are occasionally seen.

Copper is one of the metals most extensively used in the arts. It is about nine times heavier than water, melts at 2,000° F., and when cold can be drawn into fine wire and rolled into very thin sheets. It is more elastic than any other metal except steel, and ranks next to silver as a conductor of electricity. It remains bright in dry air and pure water, but when exposed to damp air it turns a reddish-brown, owing to the formation of an oxide, and long exposure to such an atmosphere causes the formation of a green substance commonly known as *verdigris.* Copper articles found in the tombs of the ancient Egyptians are covered with verdigris, and it gives them a very ancient appearance. The same effect can be produced in a few hours by the use of acids, and unscrupulous dealers often impose upon tourists as objects of great antiquity articles of modern make that have been subjected to this treatment.

Uses of Copper. Besides those already mentioned, there are many other uses to which copper is put. It forms a part of many alloys, as brass, gun metal, bell metal and various other bronzes. It is used by all nations in making an alloy for small coins, like the American and the Canadian cent, and a small portion is added to silver in making silver coins. It is extensively used in the manufacture of electrical machinery and apparatus, and hundreds of thousands of miles of copper wire are in use for carrying electric current, for light, power and telephone and telegraph systems. The trolley wires on street car lines are copper. It is occasionally used for covering roofs, and is very generally employed in sheathing the bottoms of ships used on the ocean, because salt water will not corrode it. It is also very essential in making casings for ammunition for the great guns used in modern warfare.

Copper Ores. Copper ores are widely distributed, being found in North America, nearly all countries of Europe, in Japan, Africa, Australia and South America, where there are extensive mines in Chile. In Canada, large



Figures Represent Millions of Pounds

COPPER PRODUCTION

The figures represent an average annual production covering five years.

deposits of copper ore are found in British Columbia; at Sudbury, Ontario, where it is combined with nickel; and in and about Sherbrooke, Quebec. The Canadian output is about 75,000,000 pounds yearly. In the United States is produced more than half of the world's supply. It is found in Keweenaw Peninsula, Mich., in and around Butte and Anaconda, Mont., in Arizona and Utah, and in small quantities in a number of other states and in Alaska. Contrary to very general belief, Michigan does not lead in copper production, as it once did, but that state produces the best quality of the metal. Michigan has been succeeded as the greatest producer by Montana, and in turn Montana has fallen behind Arizona (see diagram).

The ore supplying the largest amount is *copper glance*. Copper pyrites and copper carbonate are also valuable ores, and usually contain lead and silver. The copper obtained from the Lake Superior mines is in a nearly pure state, and is easily obtained by crushing the rock and separating the metal from it. There are a number of compounds of copper not ores, all of which are very poisonous.

Preparation. Most of the ores contain sulphur and more or less rock that has no copper. When taken from the mine these ores are crushed and concentrated, that is, the copper-bearing portion is separated from the waste by running the crushed ore with water over tables that are in constant vibration. The copper-bearing rock, being the heavier, settles, and the waste is washed away. The ore is then roasted to drive off the sulphur, after which it is smelted, forming *matte,* which is a mixture of copper and slag. The matte is again smelted, and the impurities are thus removed. The metal obtained by the second smelting is known as *blister copper* and is sufficiently pure for ordinary usage. In some works the Bessemer process is used; this produces blister copper from the ore.

The purest copper is obtained from the blister copper by electrolysis (which see). The process consists in placing a quantity of the impure metal in a tank containing a solution of blue vitriol and a little sulphuric acid and attaching it to the negative electrode, then attaching a small piece of pure copper to the positive electrode, and turning on a strong current. The current dissolves the copper from the mass at the negative electrode and deposits it on the positive electrode, the same as in electroplating, and the impurities fall to the bottom of the tank.

History. Copper has been known and used longer than any other of the common metals. The Egyptians were familiar with it at least 5,000 years before Christ, and possibly earlier. It is often mentioned in the Old Testament; tools of bronze are found side by side with those of stone in Europe in dwellings of a race so ancient that we cannot tell when they lived. Some of the Indians around Lake Superior had hammer heads of copper when they were first known to the Jesuit missionaries, and these tools were the first evidence white men obtained of the existence of copper in this region.

Copper Compounds. Most copper compounds are blue or green in color. The most familiar is the sulphate, which, combined with water, forms large blue crystals, known as *bluestone,* or *blue vitriol.* When these crystals are heated the water is driven off, and the uncombined copper sulphate is left as a white powder. If the white powder is allowed to stand in moist air, or if it is dampened, it turns blue again. Some copper compounds were formerly used as blue and green pigments. Chief among these was *Paris green.* All copper compounds are poisonous, and Paris green is doubly so, as it contains arsenic also. Neither it nor any other copper compound is now much used in paint. Copper compounds are often used to kill fungi and insects injurious to plants; thus potatoes are sprayed or dusted with Paris green to poison beetles, seed grain is dipped in copper sulphate solution to kill smut spores, and Bordeaux mixture (made by mixing copper sulphate solution with lime) is applied to grape vines to destroy the mildew and to fruit trees to rid them of fungi. J.F.S.

Related Subjects. The reader is referred to the following articles, in their alphabetical order in these volumes:

Alloy
Arizona
Brass
Bronze
Copper Glance
Ductility
Michigan
Montana
Steel (for *Bessemer Process*)

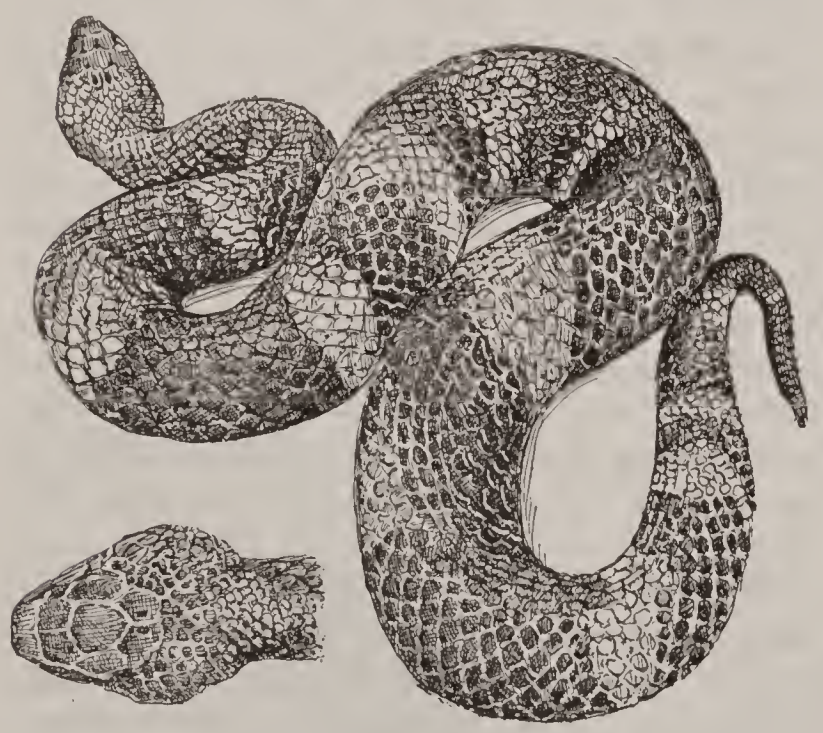
COPPERAS, *kop'er as,* also known as GREEN VITRIOL, is a compound of iron and sulphuric acid, which occurs in light green crystals. It has a puckery taste and a somewhat disagreeable odor. When exposed to the air the crystals absorb moisture and turn a rusty brown. Copperas is extensively used in dyeing fabrics black, and in the manufacture of ink and as a disinfectant. It is made by decomposing iron in sulphuric acid and by decomposing iron pyrite, which is a compound of iron and sulphur.

COPPER CLIFF, a mining town in the Sudbury district, Ontario, five miles west of the town of Sudbury, on the Algoma Eastern and the Soo line of the Canadian Pacific Railway. At Sudbury connection is also made with the Canadian Northern system. As its name indicates, the town owes its origin to rich copper deposits, which were first worked about 1887. Later the mines were found to contain nickel, and Copper Cliff now has the largest nickel plant in the world. Practically the entire town site and most of the buildings, including a $250,000 hospital, completed in 1913, are owned by the Canadian Copper Company,

whose mines and smelters have about 3,500 employees. Population in 1911, 3,082; in 1921, about 2,597; a large percentage is of foreign birth, consisting mainly of Italians, Poles and Finns. G.E.S.

COPPER GLANCE, a mineral, one of the chief ores from which copper is extracted. It is also known as *chalcocite,* or *vitreous copper,* and is usually found together with the other important copper ore, known as chalcopyrite, or yellow copper ore. Copper glance is a sulphide of copper (chemical formula is Cu_2S), and is composed of nearly eighty per cent copper and twenty per cent sulphur. This mineral is of a dark leaden-gray color, with a metallic luster, which, however, becomes gray or dull when exposed to light. It is soft and can be easily cut with a knife. Copper glance is found in large quantities in the Lake Superior copper region, in New Mexico, near the Gila River in Arizona, and in small quantities near Bristol, Connecticut. In Europe it is found in Cornwall, England, and in some parts of Germany and of Sweden. See COPPER.

COP'PERHEAD, a very poisonous serpent of the rattlesnake family, found in the United States from Southern New England to the Mexican boundary, below which there are few. It is known by various names, depending on



COPPERHEAD
Below is larger detail of top of head.

the locality; in the South it is called the *cotton-mouth;* in other places the *pilot snake,* the *red adder,* the *red eye,* and incorrectly, the *moccasin,* for its relative, the water moccasin. This snake may grow to be four feet long. Its head is copper-colored, its body light brown or golden, with Y-shaped black marks along its sides, which generally extend to the middle of the back. It lies dormant in winter. Its bite is more dangerous than that of a rattlesnake, and is usually fatal unless medical assistance is speedily at hand. However, it is a sluggish creature and does not bite unless molested or surprised. See RATTLESNAKE.

COPRA, *kop'ra,* the dried meat or kernel of the cocoanut, one of the principal articles of export from the Pacific islands. It is valued especially for the oil it yields, which is used in the manuufacture of candles and soap. The cocoanut-stearin, or cake which remains after the oil has been removed from the dried kernel, is used for fodder and manure, in much the same manner as cottonseed-oil cake. When dried in the sun or in a kiln, copra yields from fifty to sixty-five per cent of oil. Dried by hot air, however, often as high as seventy-four per cent has been obtained. The copra of thirty ordinary cocoanuts will yield a gallon of oil. See COCOANUT.

COPTS, *kopts,* a group of Egyptians who are Christian descendants of the ancient inhabitants of the country. They number about 700,000, and are found mainly in the towns of Upper Egypt, mostly south of Assuan. Saint Mark is honored as the evangelist who led their forefathers into the light of Christianity. The majority of the Copts are members of the old National Church which broke away from the Roman Church in A.D. 451, owing to differences in belief concerning the nature of Christ. A few belong to the Greek and the Roman Catholic churches. The Copts are of lighter color than the Mohammedan peasants, and are not so tall. Their distinctive dress consists of a black coat and a black or blue turban, a garb they were compelled to wear when suffering from Mohammedan persecutions. The Copts are skilful accountants, and many are goldsmiths and money-lenders. They do not as a rule become tillers of the soil.

COPYRIGHT, the exclusive right which authors and artists secure, by law, to publish and sell their productions for a specified length of time. Copyright legislation began in the United States in 1790, and in 1909 a law went into effect which amended and consolidated all previous acts respecting copyright. This law, as amended by Congress in 1912, provides that the following works may be copyrighted:

(a) Books, including composite and cyclopedic works, directories, gazetteers and other compilations.

(b) Periodicals, including newspapers.

(c) Lectures, sermons, addresses, prepared for oral delivery.

(d) Dramatic or dramatic-musical compositions.
(e) Musical compositions.
(f) Maps.
(g) Works of art; models or designs for works of art.
(h) Reproductions of a work of art.
(i) Drawings or plastic works of a scientific or technical character.
(j) Photographs.
(k) Prints and pictorial illustrations.
(l) Motion picture photo plays.
(m) Motion pictures other than photo plays.

The law extends to applicants who comply with its provisions the right to print, reprint, publish, copy and sell the copyrighted work; to translate it or make any other version of it, if it is a literary work; to dramatize it, if it is a non-dramatic work; if a drama, to convert it into a novel; if a musical work, to arrange or adapt it. A model or design for a work of art may be copyrighted and completed later; copyrighted sermons, lectures or addresses may be delivered or their delivery be authorized. A dramatic work or any version of it may be publicly performed. In the case of encyclopedias, reviews, magazines and other periodicals the copyright is vested in the proprietors, as if they were the authors. The publishing of a book includes the setting of the type, the making of the plates, the printing and the binding, all of which must be done in the United States. If it be not wholly an American product protection is afforded under the laws governing international copyright (see page 1576).

To obtain a copyright for a work which is to be published, send to the Register of Copyrights, Library of Congress, Washington, D. C., for an application blank. Fill this out and return it with a postal money order or bank draft for $1.00, and at the same time send two copies of the publication which is to bear the copyright imprint, which should appear on the title page or the page following. The prescribed form of the imprint is "Copyright 19— by (author's or publisher's name)." The two copies of the copyrighted work which are sent to the Register are deposited in the Library of Congress. There are special rules governing the copyrighting of works not intended to be sold. This and all other information may be obtained by writing to the Register of Copyrights at Washington.

The copyright secured by the above law runs for a period of twenty-eight years; one year before the expiration of the original copyright the author, or in case of his death, his heirs, may obtain a renewal for a period of twenty-eight years by making a new application. The copyright ceases when the term of renewal expires.

Canada. The administration of the copyright law in Canada is under the jurisdiction of the Department of Agriculture, and all communications are addressed to the Minister of Agriculture, Trade-mark and Copyright Branch, Ottawa. Copyright may be secured by any producer of a literary, scientific or artistic work or composition who is "domiciled in Canada or in any part of the British possessions, or any citizen of any country which has an international copyright treaty with the United Kingdom in which Canada is included." The fee for securing a copyright is $1.00, and with the application must be sent three copies of the production, if the same is a book, map, chart, musical composition, photograph, print, cut or engraving; if copyright is asked for an original painting, drawing, statue or piece of sculpture, a description of the work must appear on the application blank. The copyright period is twenty-eight years, and the renewal period fourteen. The legal form for the copyright notice, which must appear on the title page, or the page following, of every copyrighted book, is, "Copyright, Canada, 19—, by A. B."

The conditions for obtaining a Canadian copyright are as follows: The work must, before publication or production elsewhere, or simultaneously with the first publication or production elsewhere, be registered in the office of the Minister; such work must be printed and published or produced in Canada, or be reprinted and republished or reproduced in Canada, within one month after publication or production elsewhere.

Great Britain. According to the provisions of the Imperial Copyright Bill which went into effect July 1, 1912, the British copyright may apply to any literary, dramatic, musical or artistic work, including the delivery of lectures, sermons and addresses, the dramatizing of novels, the converting of dramas into novels, and the making of any device for reproducing sound or pictures. In the 1912 act architectural drawings were included for the first time. Copyright endures through the lifetime of an author and for fifty years after his death.

Registration was abolished by the Imperial Copyright Act, the publication of a work being equivalent to the securing of a copyright.

Publication is defined to mean "the issuing of copies to the public." The act applies to all parts of the British Empire, but may be modified or rejected in those colonies which have self-government; namely, the Dominion of Canada, Australia, South Africa, New Zealand and Newfoundland.

International Copyright. By international copyright is meant the arrangement made by different countries whereby books or other prints published in one country may be circulated in another, with copyright protection to the author or owner. Most of the European nations became members of the International Copyright Union by signing the treaty known as the Bern Convention (1887). The United States cannot enter the Union because the American copyright law provides that books copyrighted in the United States must be manufactured there, except when they are of foreign origin and in some other language than English. In 1910 the Berlin Convention came into force, establishing a new basis of international protection for members of the International Union.

Before 1891 the benefits of the American copyright were not extended to others than citizens of the United States, but in that year an act was passed giving to the citizen of a foreign nation the privilege of copyrighting his work in the United States, provided his native country extended like benefits to American citizens. The President of the United States declares by proclamation which countries have copyright relations with the United States. B.M.W.

For description of protection guaranteed inventors and manufacturers by governments, see PATENT; TRADE-MARK.

COQUELIN, *ko klaN',* BENOIT CONSTANT (1841-1909), a versatile French actor, especially successful in classical comedies, who became popular in the United States through his most celebrated rôle, *Cyrano de Bergerac,* in the play of the same name. He showed dramatic talent at an early age and was given a course in the Paris Conservatoire. The appealing simplicity of his presentations of *The Marriage of Figaro, The Misanthrope* and *The Barber of Seville* won him wide popularity. In the several visits which he made to the United States and Canada he was enthusiastically received. His last appearance in America in 1900-1901 was with Sarah Bernhardt, as Flambeau in *L'Aiglon.*

CORAL, *kor'al,* an animal formation, called a stone, with an interesting history. It is difficult to realize, when looking at an ornament or a necklace made of polished, reddish-pink coral, that it was formed of the shells of multitudes of very small, tropical sea animals. Yet this is true. Long ago, when the fishermen found this substance in beautiful flowerlike forms, they believed it to be sea flowers which hardened when brought above water. But a diver found they were as hard below water as above, and then scientists investigated further. Now we know that coral is a substance formed by little jellylike animals of the sea called *polyps,* that is, *animals with many feet.*

VARIOUS FORMS OF CORAL

(*a*) Orange sea fan; (*b*) East Indian coral; (*c*) sea plume; (*d*) from the Bahamas; (*e*) from the vicinity of Singapore; (*f*) a Florida specimen.

Their organism consists of a central sac or stomach, edged with many tiny feathery arms or tentacles with which to anchor themselves to the bed rock of the sea. Living on the sea water, they absorb a limy substance therefrom which they then secrete and build around themselves as a shell. New polyps grow from the parents like buds and always remain at-

tached to each other. So the process of home-building goes on and on until many shapes are formed, the solid skeleton remaining even when the animals which made them are dead. And so billions and billions of families of coral animals build formations as beautiful, substantial and in some respects as remarkable as man-made cities.

Coral Formations. There are two general classes of coral formations—those of fanciful shapes in white, yellow, pink, red or black, forming some of the most beautiful sea gardens, and the coral reefs, which are amazing pieces of animal-architecture. Under the former may be grouped the sea fan, the madrepore, or tree coral, the mushroom, the organ pipe, the brain coral and various flower shapes.

Coral Reefs. In the surging waters of the ocean where man with his skill and ingenuity has found it difficult, sometimes impossible, to build, this tiny jelly-mass, the polyp, has built permanent wall-like structures. There are three classes, formed chiefly by the *anthozoan* polyp, occurring for the most part in the tropical regions of the Pacific and the Indian oceans; the *fringing reef,* the *barrier reef* and the *atoll.* A fringing reef is a broad bank or platform of coral rock lying near the shore of an island or a continent. There are fringing reefs along the coast of Florida and of the West Indies.

A barrier reef is a large fringing reef, sometimes of vast extent. The great Australian barrier reef is 1,250 miles long (see Barrier Reef). But openings usually occur in barrier reefs, caused by the action of fresh sea-water streams on the lime of the coral rock. The outer wall usually rises from great depths but never reaches the surface because the little marine builders cannot live above or at the surface of sea water. Sometimes lovely tropical islands are found on coral barrier foundations. The atoll is a ring-shaped barrier within which is a shallow lake. Atolls were probably at one time fringing reefs about an island which later disappeared and remained submerged, while on the reef the little builders continued their work. See Atoll.

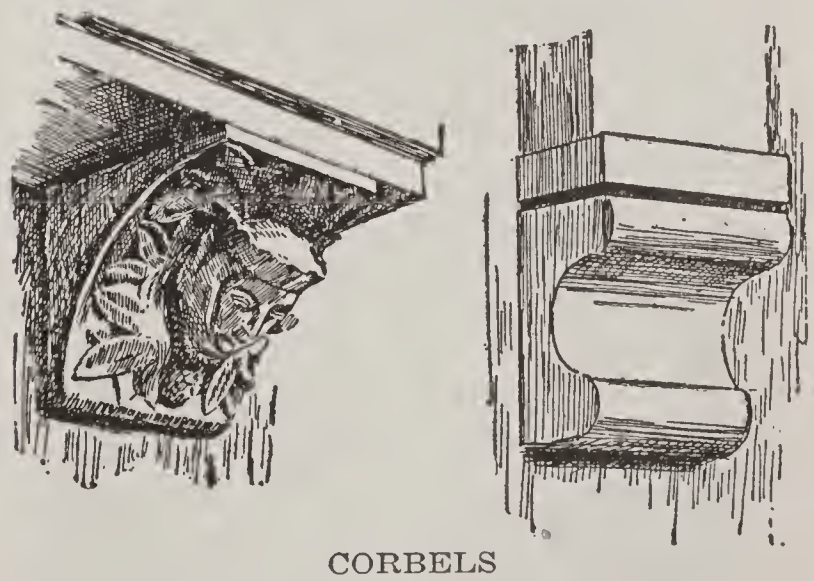
Precious Coral. Though all coral formations are curious and interesting, only one, the *precious* coral, is of economic value. This is usually the *madrepore,* or tree coral, which forms in the shallow waters on both sides of the Mediterranean Sea and around its islands. It is either pink or red, is used for jewelry and personal adornment, and is sold chiefly in India. The best quality is very valuable, being worth from $400 to $700 an ounce. The ordinary red coral commands $10 an ounce, while the broken red coral for necklaces is worth $1 an ounce. Black coral was once abundant in the Persian Gulf, but is now found chiefly along the Australian Barrier Reef. Fishing companies are organized to dredge for corals. Large boats often collect as much as 650 to 850 pounds in a season; the smaller ones, 390 to 500 pounds.

Although no coral reefs are found on the American coasts north of Florida, coral is found in shallow waters as far north as New England, but the coral animal will not live in a temperature lower than 68° F. In ancient and medieval times considerable superstition attached to coral, and medicinal properties were assigned to it. Even now it is worn in Italy as a charm against the "evil eye." M.S.

Consult Dana's *Corals and Coral Islands;* Agassiz's *Visit to the Great Barrier Reef of Australia.*

CORAL SEA, so named on account of the great number of coral reefs it contains, is that part of the Pacific Ocean which lies between the northeast coast of Australia, the Solomon Islands and the New Hebrides. Some of the most remarkable coral formations in the world are found in this sea. The boundaries are indefinite, and the name might well be applied to nearly all parts of the Southern Pacific Ocean. See Coral.

CORBEL, *kawr'bel,* a form of architectural support, first widely used in the Middle Ages. It is a piece of stone, wood or iron projecting



CORBELS

from the vertical face of a wall of a building, to support floor beams, projecting moldings of doors and windows or other similar parts of the structure. There are varieties of forms of corbels, and they are ornamented in many ways; in Scott's *Lady of the Lake* is the sentence, "The corbels were carved grotesque and

grim." Corbels were especially prominent in Gothic architecture.

CORCORAN, *kawr'ko ran,* **ART GALLERY,** one of the beautiful buildings in Washington, D. C., near the White House, the home of a famous collection of the finest sculptures and paintings in America. A free school of art is also maintained in the institution. Biennial exhibitions of American paintings of the day add interest to the gallery. Two works of sculpture exhibited there are of special merit—Powers' *Greek Slave,* of which there are many replicas, and *Dying Napoleon,* the most famous work of Vela. This gallery of art was founded by William W. Corcoran, and endowed by him with a fund of $900,000.

William Wilson Corcoran (1798-1888), a wealthy American banker and philanthropist, was born in Georgetown, D. C., now a part of Washington. From 1828 to 1836 he was the real estate agent in the District of Columbia for the United States Bank. In 1837 his career as a banker and broker in Washington began, and during the Mexican War he amassed a great fortune. Retiring from business in 1854, he devoted much of his time to philanthropy, and established the art gallery described above.

CHARLOTTE CORDAY IN PRISON
From a painting by Müller.

CORDAY D'ARMONT, *kohr deh' dar mahN'* Marie Anne Charlotte (1768-1793), was one of the most courageous and contradictory characters of the French Revolution, for she was both a patriot and an assassin. She was born and educated in Normandy, and in spite of her noble birth she found herself completely in sympathy with the people at the outbreak of the Revolution. However, when Marat, their leader, incited them to hideous cruelty and massacres, she became a member of the party which supported neither nobility nor peasantry and was hated by both (see Girondists). She became obsessed with the idea that Marat's death would mean the relief of France, so she journeyed to Paris, and on the 13th of July, 1793, forced her way into the presence of Marat, who was bathing to relieve a fever which tormented him. Under pretense of giving him Girondist information, she stabbed him. She was condemned to die on the guillotine, and went to her death with the same lack of fear which had marked the planning and execution of Marat's murder. See Marat, Jean Paul.

CORDILLERA, *kawr dil'ya ra,* or *kawr dil' er a,* or **CORDILLERAS,** a term somewhat indiscriminately applied to the mountain systems which extend along the western coast of North and South America from Alaska to Cape Horn. The name is Spanish, meaning a *cord* or *string,* hence its applicability to what is usually called a *chain* of mountains. In the geographical term Cordilleras are now included the Rocky Mountains, the Sierra Nevadas and the Coast and Cascade ranges in the United States; the British Columbia and Alaska chains; and the Andes and their connecting systems.

CORDITE, *kawr'dite,* a smokeless gunpowder used in the British army and navy. The name has no reference to its composition, but refers to the cordlike shape in which it is made, instead of the granulated form usually adopted. It is composed of a combination of nitroglycerine, nitrocellulose and vaseline. Constant experiments have resulted in modifications of the formula. The original formula was fifty-eight parts of nitroglycerine, thirty-seven parts of nitrocellulose and five parts of vaseline. The cordite now used contains over eighty per cent of nitrocellulose and only fifteen per cent of nitroglycerine. Cordite burns slowly when ignited, but explodes when subjected to the pressure resulting from striking its mark after firing. It is used in both cannon and small arms.

CORDOBA, or **CORDOVA,** *kawr doh'va,* capital of a province of the same name in the north-central section of Argentina, in Southb

America, northwest of Buenos Aires. It is now a flourishing commercial center and exports quantities of live stock, wool and hides. There is no better grazing section in all Argentina. The surrounding territory depends entirely upon irrigation for successful agriculture, and twelve miles from the city is a great dam across the Rio Primero which furnishes an abundant supply of water. Cordoba was founded in 1573, but the vicinity had been thoroughly explored thirty years before. Population in 1920, 104,894.

CORDOVA, or **CORDOBA,** one of the ancient Moorish cities of Spain, containing many fine examples of Moorish architecture. It is situated on the banks of the Guadalquivir, about eighty-six miles northeast of Seville. The old city streets are narrow, crooked and in many parts dirty, but there is a more modern portion which shows little trace of the Moorish occupation. The cathedral is the most remarkable structure in the city, having originally been a mosque which has been altered from time to time to make it conform to the requirements of a modern cathedral. Like most Spanish cities, Cordova conveys to the visitor an idea of languor or carelessness. The city was once a great commercial center, but its importance has declined. The inhabitants take their *siesta,* or noonday rest, more seriously than they regard commercial occupation. Population, at the height of its Saracen splendor, estimated at over 1,000,000; in 1910 it was 65,000.

CORDUROY, *kawr'du roi,* a strong, thick cotton material, very serviceable for garments for outdoor sports or labor. It has **a** cut pile, like velvet, but is corded or ribbed on the surface. The name comes from the French and means *king's cord,* because in the seventeenth century the material was used for the outer garments of the king's huntsmen. It is sometimes used for furniture covering and fancy work.

Corduroy road is an expression used in the United States to signify a rough road made by laying logs side by side to cover swampy or marshy places.

CORELLI, *ko rel'i,* MARIE (1864-), an English writer of sensational and melodramatic novels, several of which have been dramatized for the stage and for moving pictures. She was born in Italy, but was educated in England and France. In her childhood, Charles Mackay, the poet, adopted her. Corelli was at first simply a pen name, but is now her legal name. The first work of this weaver of emotional tales was *The Romance of Two Worlds,* appearing in 1886. Among her other most widely known novels are *Thelma, Barabbas, The Sorrows of Satan, The Master Christian, Temporal Power, God's Good Man, Free Opinions, The Treasure of Heaven, Holy Orders, The Devil's Motor, The Life Everlasting* and *Innocent, Her Fancy and His Fact;* the last named appeared in 1914. In her fifty-fifth and fifty-sixth years (1920 and 1921), without abatement of power, she published *The Love of Long Ago and Other Stories* and *The Secret Power.*

Marie Corelli's present home is in that historic town, Stratford-on-Avon.

CORIANDER, *ko ri an'der,* an herb of the parsley family, cultivated for its fruit, which when dried is used as a spice to flavor curries, sauces and liqueurs, and is often found in little, round, pink-and-white candies. Coriander is also useful in cases of chronic dyspepsia. The plant grows to a height of three feet, has very finely-divided leaves with a disagreeable odor, and small white flowers. The fruit, however, when dry, is pleasantly fragrant and sweet to the taste. Coriander is cultivated less in the United States and Canada than in Europe, caraway being more favored on the west Atlantic shores.

CORINTH, *kor'inth,* one of the most notable cities of the ancient world, founded in Greece nearly 3,000 years ago. Its situation at the

CORINTH

Locations of the city, surrounding political divisions, gulf, isthmus and famous canal.

(*a*) Etolia
(*b*) Phocis
(*c*) Boeotia
(*d*) Attica
(*e*) Achaia
(*f*) Corinthia

southern extremity of the Isthmus of Corinth, which joins the Peloponnesus, or lower peninsula of Greece, to the northern mainland, made it the most important trading center of the

Greeks in the eighth century B. C. It lay between two gulfs, the Corinthian on the west and Saronic on the east, on each of which there was a fine harbor. The city was built to the north and at the foot of a hill 1,886 feet high, a natural citadel more imposing than the famous Acropolis of Athens, and was surrounded by walls having a circuit of ten miles. Two parallel walls connected the city with its harbor on the west, and a chain of fortifications with the harbor on the east, while across the isthmus a tram-road was built by which vessels could be hauled from one harbor to the other.

Who founded the city of Corinth is unknown. In the myths of Homer the place is called *Ephyra,* and it is mentioned as the home

ALL THAT REMAINS OF CORINTH

Of the great ancient city only a single ruin remains, and it is one of the most interesting relics of antiquity. The original of the illustration was a great temple; seven fluted Doric columns survive, each a single stone twenty-three and one-half feet in height and over seventeen feet in circumference at the base. The Apostle Paul saw its courts frequented by worshipers; from their numbers he drew in part the members of the church he founded. Around this building stretched the streets, mansions and other temples of a splendid metropolis.

of Sisyphus, Bellerophon and Medea. To its reputation as a great commercial center was added that of one of the wickedest cities of its time, for its wealth and prosperity were a source of corruption to its inhabitants. In art and literature Corinth ranked far below Athens, but the Corinthians were skilled workers in bronze and clay, and their city was adorned with costly statues and paintings. The Corinthian clay vases, with their fantastic decorations, were famous. Most of the temples, shrines, statues and tombs mentioned by the ancient writers have disappeared, but there still survive seven massive columns of a temple to Apollo, dating from the sixth or seventh century B. C.

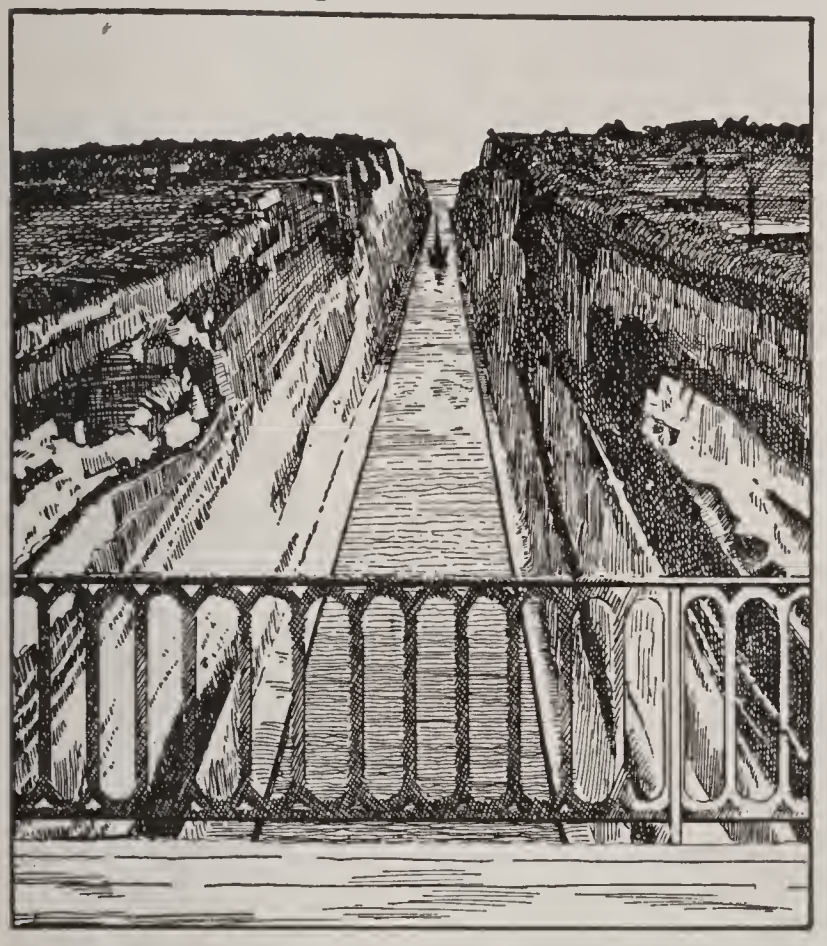
As Athens rose to supremacy in Grecian affairs its increasing importance as a commercial state awakened a spirit of jealousy in the ambitious city of Corinth, and the latter became an ally of Sparta in the Peloponnesian War (which see). Though leagued with other Grecian states against Sparta in the Corinthian War, between 395. B. C. and 387 B. C., Corinth returned to its former allegiance and aided Sparta in the struggle with Thebes. As the last uprising against Rome had its center in Corinth, the city was completely destroyed in 146 B. C., by Lucius Mummius, the Roman general. A century later Julius Caesar rebuilt it, and it became the prosperous capital of the Roman province of Achaia.

Saint Paul's missionary labors took him to Corinth (see *Acts* XVIII, 1); there he founded a church, and two of his epistles were addressed to the Corinthian Christians. After being twice captured by the Turks and once by the Venetians, and given over to the flames in the Greek Revolutionary War, Corinth was finally destroyed by an earthquake in 1858. The modern town, built three and one-half miles northeast of ancient Corinth, has a population of about 5,000.

The Isthmus of Corinth, separating the Gulf of Corinth from the Saronic Gulf, is a neck of land about ten miles long and from four to eight miles wide. The Peloponnesus is sometimes likened to a mulberry leaf, and the isthmus to the stalk from which it hangs. In ancient times a wall was built across this neck of land to keep out invaders from the north, and on the Saronic Gulf, at the place where the wall terminated, the modern town of Isthmia has grown up. On the site of the town the Greeks were accustomed to celebrate the Isthmian games (which see), and a few ruins of the old stadium may still be seen there. The ancient city of Corinth was situated at the southern end of the isthmus.

The Corinth Canal, which connects the Gulf of Corinth with the Saronic Gulf, was begun in 1882 by a French company and completed by the Greeks in 1893. An unsuccessful attempt to construct such a canal had been made by Emperor Nero. The canal is four miles long, seventy feet wide and twenty-six feet deep. Ships sailing from Adriatic ports to the Piraeus, the seaport of Athens, shorten that

voyage about 200 miles by crossing through the canal, but foreign steamships usually take the longer route because of the channel's narrowness and the strength of the current. The canal



CORINTH CANAL
As seen from one of its bridges.

has at its eastern extremity the town of Isthmia; at its western, Poseidonia. B.M.W.

CORINTHIANS, *ko rin' thi anz,* EPISTLES TO THE, two letters written by the Apostle Paul to the Christian Church in Corinth during A. D. 57. The first was written from Ephesus, probably early in the year, and the second is supposed to have been written from Macedonia some months later. The first Epistle was caused by dissensions in the Church at Corinth and the continuation of certain heathen practices of some of the Christians. In this Epistle occurs Saint Paul's discourse on love, one of the gems of the world's literature. Another celebrated passage in this Book is the writer's argument in favor of the resurrection of the dead. The second Epistle is supplementary to the first; it encourages the Corinthians to continue in the faith and warns them against the dangers with which they are surrounded. See PAUL; CORINTH.

CORIOLANUS, *ko ri o la' nus,* a Roman patrician of the early republic, the hero of a well-known legend of that period. In 491 B. C., during a severe famine, he proposed that no grain should be distributed to the common people unless they gave up their tribunes. This suggestion stirred up such a storm of indignation among the plebeians that Coriolanus was banished; he took refuge with the Volscians, the bitterest enemies of his country. Placing himself at the head of the Volscian armies, he led them to the very gates of Rome, refusing to listen to the pleas for peace made by the Roman Senate. Finally his aged mother came into his camp, and mingling her entreaties with her tears, prevailed upon him to spare the city. This story has been immortalized in Shakespeare's drama, *Coriolanus.* See TRIBUNE.

CORK, *kawrk,* the spongy outer layer of bark in a tree known as the *cork oak,* composed of the thickened walls of cells whose living contents have disappeared. Cork is light, strong, durable, compressible and elastic, and neither air nor water can pass through it; it therefore possesses a combination of qualities that makes it one of the most valuable products man has appropriated for his use.

The Tree. The cork oak is a small evergreen tree which grows most abundantly in Spain and Portugal, from which seventy per cent of the world's supply of the product is obtained. Tunis and Algeria are next in importance, in production, followed by Southern France and Corsica, Italy, Sardinia and Sicily, in practically the order named. The tree has been introduced into Southern California and into Mississippi, but the product yielded on American soil is of an unsatisfactory quality. The average height of the tree is thirty feet, and its circumference is six feet, but some of the larger specimens grow to be fifteen feet around. It flowers in April or May, and the fruit, which is an acorn, ripens from September to January, falling to the ground as soon as it comes to maturity. The acorns are fed to swine, to whose flesh they give a specially piquant flavor. Cork oak trees live 300 or 400 years.

Stripping the Bark. The first stripping takes place when the tree is from twenty to twenty-five years old, the first layer removed being a hard outer covering known as "virgin" bark. This, the least valuable part of the plant, is sometimes used as a tanning substance and for making rustic work for conservatories and porches. The second layer is cut off nine or ten years later, and successive strippings occur at the same intervals as long as the tree continues to bear. The best bark is obtained when the tree is from forty to fifty years old. It is from the second stripping that the cork is obtained which is used in making floats for fishing nets; this and the later barkings constitute the cork of commerce.

How the Stripping Is Done. With a long-

handled hatchet the stripper makes a cut around the base of the trunk, and another one at the top, just below the place from which the main branches spring; these circular incisions are then connected by two or more vertical cuts, and the oblong sections of curving bark are pried off with the wedge-shaped handle of the hatchet. Great care is taken not to injure the under layer, as on a bruised spot cork never grows again. The harvest season in the cork forests comes in July or August.

How Bark Is Prepared for the Market. Cork in its natural state is covered with a rough,

TAKING CORK FROM A TREE

woody layer that is scraped off after the slabs have been subjected to a boiling process. Boiling also dissolves tannic acid present in the bark, increases the volume of the cork, makes it more elastic and easier to handle, and flattens it out so that it can be conveniently packed on the backs of burros. These pack animals carry the product to the nearest railway station, from which it is sent to various ports for shipment. Before being loaded on ships, the various sections of cork are sorted according to quality and thickness, and are then packed into bales and securely bound with steel hoops or wire. The countries which receive the largest amounts of raw cork are the United States, France and Great Britain. Seville is the most important shipping center.

The Many Uses of Cork. Numerous references in classic writing show that the ancients fully appreciated the value of cork. In Plutarch's *Lives* is the story of a messenger who swam across the Tiber on pieces of cork, a primitive life preserver, and safely reached the Capitol, which was then besieged by the Gauls (400 B. C.). Pliny says that Roman ladies used cork soles to keep their feet warm; he also mentions the use of the bark for buoys of anchors and fishing nets, and he recommended pulverized cork taken in warm water as a remedy for nose bleeding.

Because of its elasticity, keeping qualities and the fact that it does not admit air or water, cork is the best substance known for making stoppers for bottles. Cork stoppers, which were first manufactured in the seventeenth century, are now in such general use that they are everywhere known as *corks,* and it is also customary to apply the name to the function and to speak of "corking up a bottle." The lightness, strength and durability of the substance are utilized in the manufacture of life buoys, belts, life preservers and other apparatus used in saving people from drowning.

As cork is a poor conductor of sound it is used to good advantage in making floors for hospitals. *Linoleum,* made by mixing cork powder with linseed oil and spreading the paste over canvas, is an excellent floor covering for offices or halls, for it deadens sound and keeps out dampness. Cork linoleum is now in general use on ships. Cork is also occasionally substituted for leather in making sweat bands for hats. Cork molds, covered with silk or cotton, are made by manufacturers of dress trimmings who desire a foundation that is durable and light. Waterproof coats made of a thin sheet of cork cemented between two pieces of silk are coming into use. In carpenter shops bands of cork are beginning to replace rubber ones for covering the pulleys over which the band saw runs. Cork is also coming into use in making floats for the carburetors of automobiles, wadding for shotgun cartridges, fabric for balloons, a filling for automobile tires, and casks and barrels in which wine is stored. The beautiful and durable Spanish, or cork, black, used in painting, is made from cork parings and waste.

Statistics of the Cork Industry. Spain produces about 78,000 tons of cork annually, nearly 55,000 tons being obtained from the Seville district. There are in Spain nearly 900 cork factories, and about 40,000 persons, who

receive an average daily wage of about sixty-seven cents, are employed in the cork industry. The United States imports raw cork valued at about $3,150,000, and manufactured products valued at about $2,350,000. There are about sixty cork factories in the United States, located in New York, Pennsylvania, New Jersey, Illinois, Massachusetts, Rhode Island, Wisconsin and Ohio. The value of the manufactured products is usually in excess of $6,000,000 a year. W.F.Z.

CORK, the most important city in the south of Ireland, capital of the county of the same name. It is situated on both banks of the River Lee, 165 miles south of Dublin. The river is navigable from the sea for a few miles above the city, and great sums of money have been spent in harbor and dock improvements. Eleven miles distant, at the mouth of the river, is the port of Queenstown, at which Atlantic steamships call on the voyage between English and American ports. The name is derived from the old Irish word *Corroch,* meaning *swamp,* in reference to the nature of the land on which the city is built. It has large iron foundries, shipbuilding yards and manufactories of leather, paper, woolen and linen goods. In the latter it excels.

During the war between Charles I and Cromwell's hosts, Cork strongly supported King Charles. It was captured and its people were severely punished by Cromwell. To the present day the Irish of Cork and vicinity refer to him with bitterness. Most of the inhabitants are Roman Catholics. Cork is a great stronghold of the adherents to the principle of Home Rule for Ireland, and its people materially assisted in obtaining the passage of that measure by the British House of Commons. The city presents a fine appearance, and its suburbs contain many fine residences. Population in 1911, 76,632. No census was taken in 1921.

CORM, *kawrm,* that part of certain plants like the crocus, cyclamen and Indian turnip which is often incorrectly called the bulb or tuber. The difference between the corm and bulb is so slight that it is usually only the scientist who marks the distinction. The corm stores food for the next year's plant in a thick, fleshy stem, whereas the bulb's food is stored in thickened leaves, the tuber in a thickened rootstock. Like some bulbs, the corm has sheaths or broad scales on the outside, but the principal part is the stem. Most corms are broader than they are high. See the article BULB, page 989.

CORMORANT, *kawr'mo rant,* a large, greedy, web-footed bird, about twenty-five known species of which are distributed all over the world. They live especially on sea coasts, but are often found inland. At least eight species of cormorants live in North America, and

THE CORMORANT

the double-crested species, when breeding in large masses on the ledges of cliffs along the sea, present an interesting sight. Especially in the Bay of Fundy they have been seen by the hundreds; there, standing almost erect, resting on their tails, they have been likened to "rows of black bottles stood out to dry," as many voyagers have remarked.

The cormorant is related to the pelican (which see). It is over thirty inches in length, has a long, strongly-hooked bill, a long neck, short wings and a short, rounded tail. The common cormorant is black, or dark-colored. The double-crested species has bronze-tinted plumage, and a crest of black, curved feathers behind each eye. The pouchlike throat is orange.

The food of cormorants is fish, for which they dive. They have been known to stay under water a long time pursuing their prey, using both feet and wings for swimming. Usually this bird with enormous appetite flies close above the water watching for fish, but sometimes it waits, perching on an overhanging branch of a tree. That habit inspired Milton in his *Paradise Lost* to liken Satan to this hungry bird, saying—

> "Thence up he flew, and on the tree of life,
> The middle tree, and highest there that grew,
> Sat like a cormorant."

Cormorants have been trained to catch fish for their masters. Especially the Chinese, with their great fondness for fish, use the bird for this task, which they cannot perform as well. A piece of hemp is tied about the neck of the bird so that it cannot swallow the fish, and it obediently swims back to the boat and delivers its catch to its master.

CORN, the most important cereal grain of the western hemisphere. In the country where it grows most abundantly—the United States—it is regarded as the symbol of the republic's wealth and greatness, for the value of the annual crop is much greater than that of all the gold and silver taken from its mines each year, and the prosperity of thousands of the farmers is due to abundant harvests of corn. One of the happiest of many tributes paid to this grain is that of Richard J. Oglesby, a former governor of Illinois, the foremost corn state in the American Union—

> Aye the corn, the royal corn, in whose yellow heart is health and strength for all the nations.

The beauty of the plant has often been praised in poetry, for the fertile farm lands afford no picture more pleasing than a field of corn ripening in the sunshine, with the tall, slender stalks and golden tassels swaying in the breeze. As an emblem of nature's bounty and of abundant harvest it has also inspired many poetic tributes; one which is especially attractive is found in the song *Columbia's Emblem,* by Edna Dean Proctor:

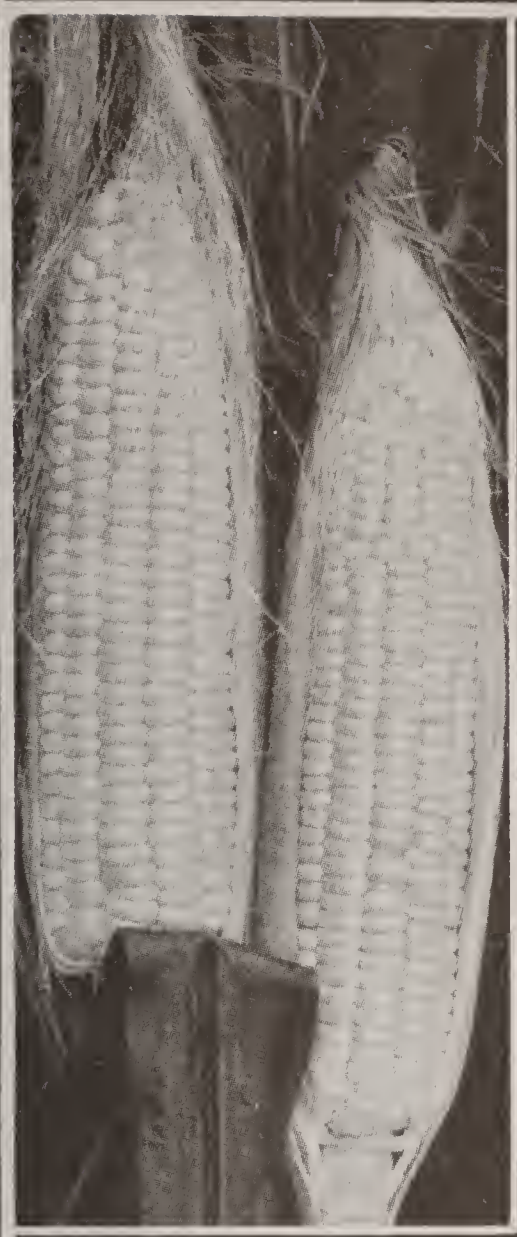
> Blazon Columbia's emblem,
> The bounteous, golden Corn!
> Eons ago, of the great sun's glow
> And the joy of earth, 'twas born.
> From Superior's shore to Chili,
> From the ocean of dawn to the west,
> With its banners of green and silken sheen,
> It sprang at the sun's behest;
> And by dew and shower, from its natal hour
> With honey and wine 'twas fed,
> Till the gods were fain to share with men
> The perfect feast outspread.
> For the rarest boon to the land they loved
> Was the Corn so rich and fair,
> Nor star nor breeze o'er the farthest seas
> Could find its like elsewhere.

The Name. The word *corn* does not have the same meaning the world over. The native name of the plant described in this article—found originally in the Americas—is *maize,* and it is known by that name generally in Europe. *Corn* has always been a general term for *grain* in Europe, and the Europeans who first became acquainted with the strange grain of the New World gave to maize the name *Indian corn.* By this latter name it is still known in England, where wheat is called corn. Across the Scottish border one may hear the name applied to oats, and in the northern part of Europe it means rye. The word also occurs in the Bible with varied meanings. In the book of *Ruth* it is recorded that in the beginning of the barley harvest Ruth went into the fields to glean the ears of corn; in *Judges* XV it is told that in the time of the wheat harvest Samson burned the standing corn of the Philistines. But in the United States and Canada the names *maize* and *Indian corn* are applied to the plant much less frequently than is the word *corn,* and the latter term occurs in all government statistics and reports.

Distribution and Production. The accompanying illustrations show the leading countries producing corn, and their average annual yield in bushels. The United States produces a larger crop each year than all the other countries combined. Canada grows only about 15,000,000 bushels annually, for the grain requires a longer growing season than most of the provinces afford, but the average yield per acre in the Dominion is considerably higher than in the United States, the proportion being about fifty-five to thirty bushels.

Description. Corn is a member of the grass family, and in general appearance resembles the sugar cane. The plant grows from a fibrous root system, producing a slender stalk, or stem, that is concave on one side and varies in length according to variety (see subhead, *Varieties,* below). Important characteristics of this stalk are its division into sections by joints, or *nodes,* its pithy center, wherein is stored the food needed to ripen the seed, and a thin, compact, outer layer which serves as a protecting covering. The stalk grows erect and puts forth long, slender, pointed leaves, of a dark green color.

Two kinds of flowers are borne by each plant—male and female. The former, which are at the top of the stalk, bear the stamens and



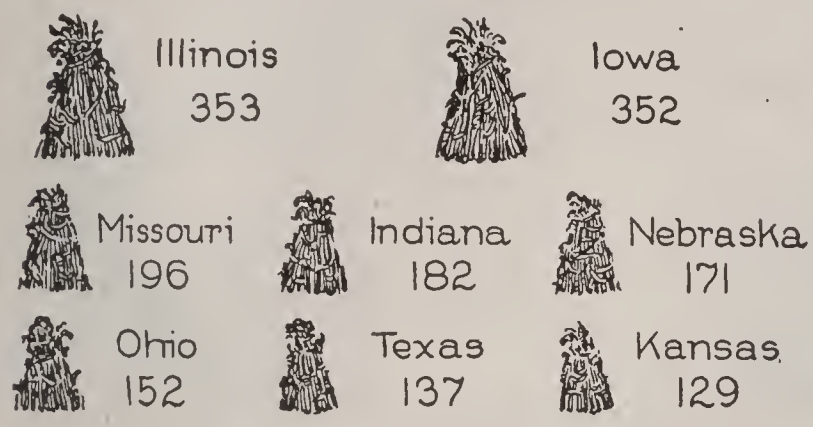
CORN.

At top: Perfect ears of sweet corn Ready for husking. Selecting his seed corn from the shock. Below: The harvest on an Illinois farm.

MAKING WORK EASIER.

A corn-cutting and loading machine is shown above. Below is a machine which cuts and husks the corn and loads the ears into the wagon.

form the *tassel;* the latter, which bear the pistils, constitute the *silk*. The silk grows on a spike (the *cob*), which springs from the stalk in the axil of a leaf. On the cob are rows of seeds (the *kernels*), and there is also a covering of specially-formed leaves (the *husks*). The cob and its parts constitute the fruit of the plant, called the *ear*. It is interesting to



LEADING AMERICAN STATES
In corn production. The figures represent an average production of five years.

know that though the ears may have eight, twelve or more rows, they always have an even number, that there is one silk for each kernel, and that there are, on an average, 800 kernels to an ear.

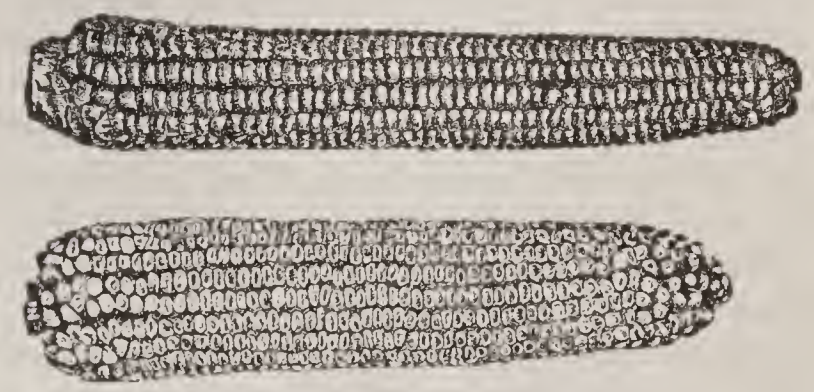
Varieties. Corn is usually divided into five great groups, according to the character of the grain, as follows: *pop corn, flint* corn, *dent* corn, *flour* corn and *sweet* corn, and there is another variety known as *pod* corn, in which each kernel is enclosed in large glumes, or bulbs. There are more than 500 named varieties of corn, some plants almost reaching a height of as many feet as smaller ones have inches. Certain tall Mexican varieties grow to fifteen feet; while Tom Thumb pop corn grows only two or three feet high. The ears vary greatly in size, also, ranging from two up to twelve inches in length. A plant may produce one ear or several, those usually grown as a forage crop producing two or three small ears. Corn can be grown only where there is plenty of sunshine and at least three months of warm weather.

Pop corn is, as its name implies, grown for "popping," which means literally turning the kernel inside out by an explosion caused by heat. Pop corn has small ears and kernels covered with a hard, strong outer coat. When heat is applied the moisture in the inside of the kernel generates steam, which gathers force sufficient to burst the kernel. Other corns are not suitable for popping; they will merely crack and parch. The pop-corn industry in large cities is important.

Flint corn has a hard, smooth outer coat, and is deep, golden-yellow in color. The ear has usually eight to twelve rows of kernels, which are very sweet and nutritious. This variety ripens in a shorter season than any other, and is therefore grown farther north than dent corn. The plants usually grow from eight to twelve feet in height.

LEADING COUNTRIES
In the production of corn. The figures represent an average production for five years.

Dent corn is the ordinary corn of commerce. This variety has an indentation on the top of the kernel, caused by shrinkage of the starchy interior. Dent corn grows large ears, with kernels considerably larger than other varieties. This



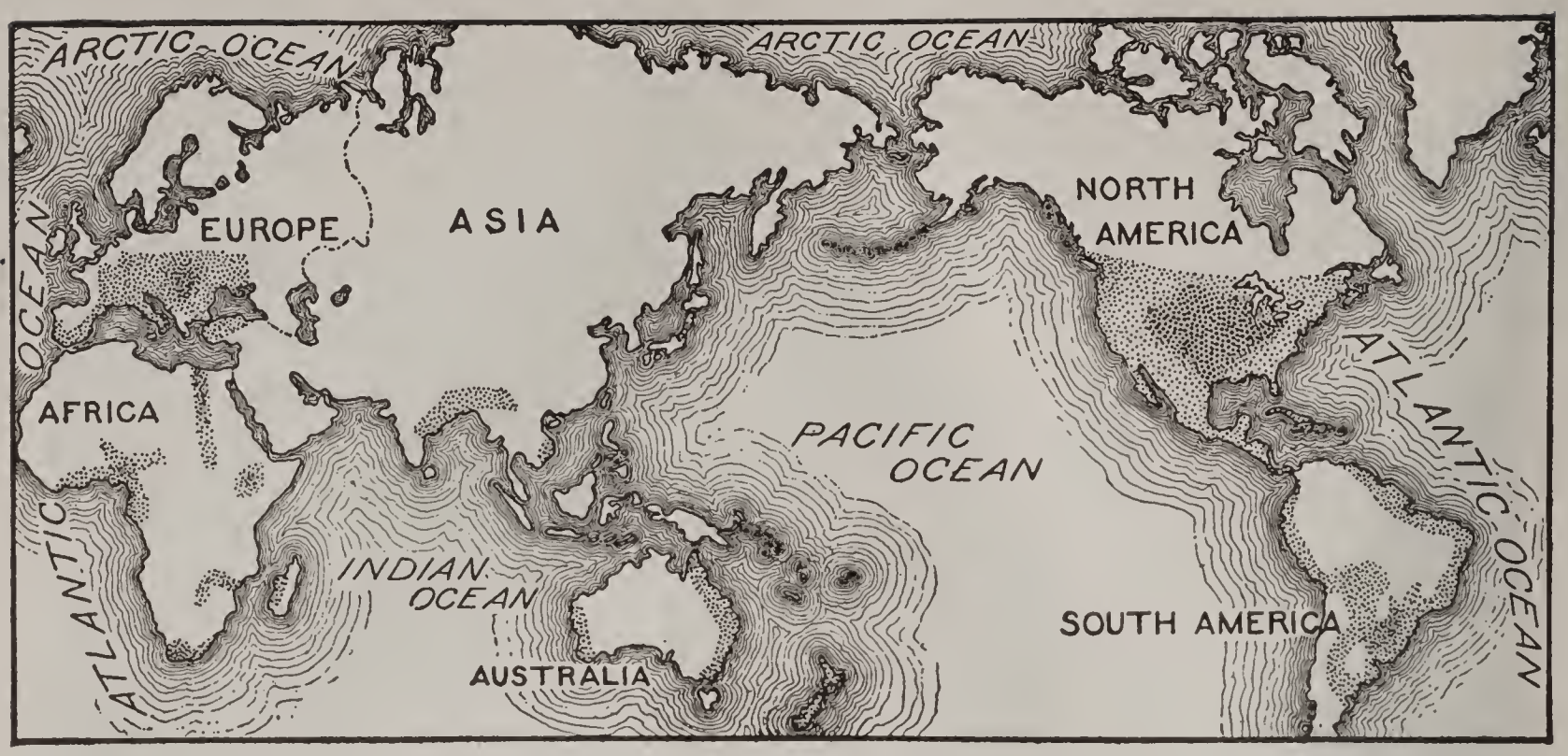
TWO FAVORED VARIETIES
Flint, above; dent, below.

variety is grown throughout the corn belt of the United States.

Sweet corn is soft, and shrinks greatly in drying. Containing a larger percentage of sugar than any other variety, with the starchy matter only slightly developed, sweet corn is largely grown for table use, being boiled on the ear. It is also canned in large quantities.

Flour corn, or *soft corn,* one of the oldest varieties known, has soft, starchy kernels, and is usually grown in the Southern states. This variety is often called *mummy corn,* because it has been found buried in mounds of the ancient Aztecs and Incas.

Culture. Corn in the North is usually grown in rows three feet apart, and in the South up to four and five feet apart. The seed is planted in hills three to four feet apart in all directions, with two or four plants per hill; another method of seeding is by drilling, in which the grains are dropped close together in rows. This method is employed only when the crop is in-



WHERE THE WORLD'S CORN IS GROWN

tended for ensilage. Machinery for the planting and culture of corn is well developed, so that practically no hand work need be done from preparing the land to harvesting the crop. However, in regions where the average acreage is small (less than ten acres per farm), the planting, hoeing and harvesting are still done largely by hand.

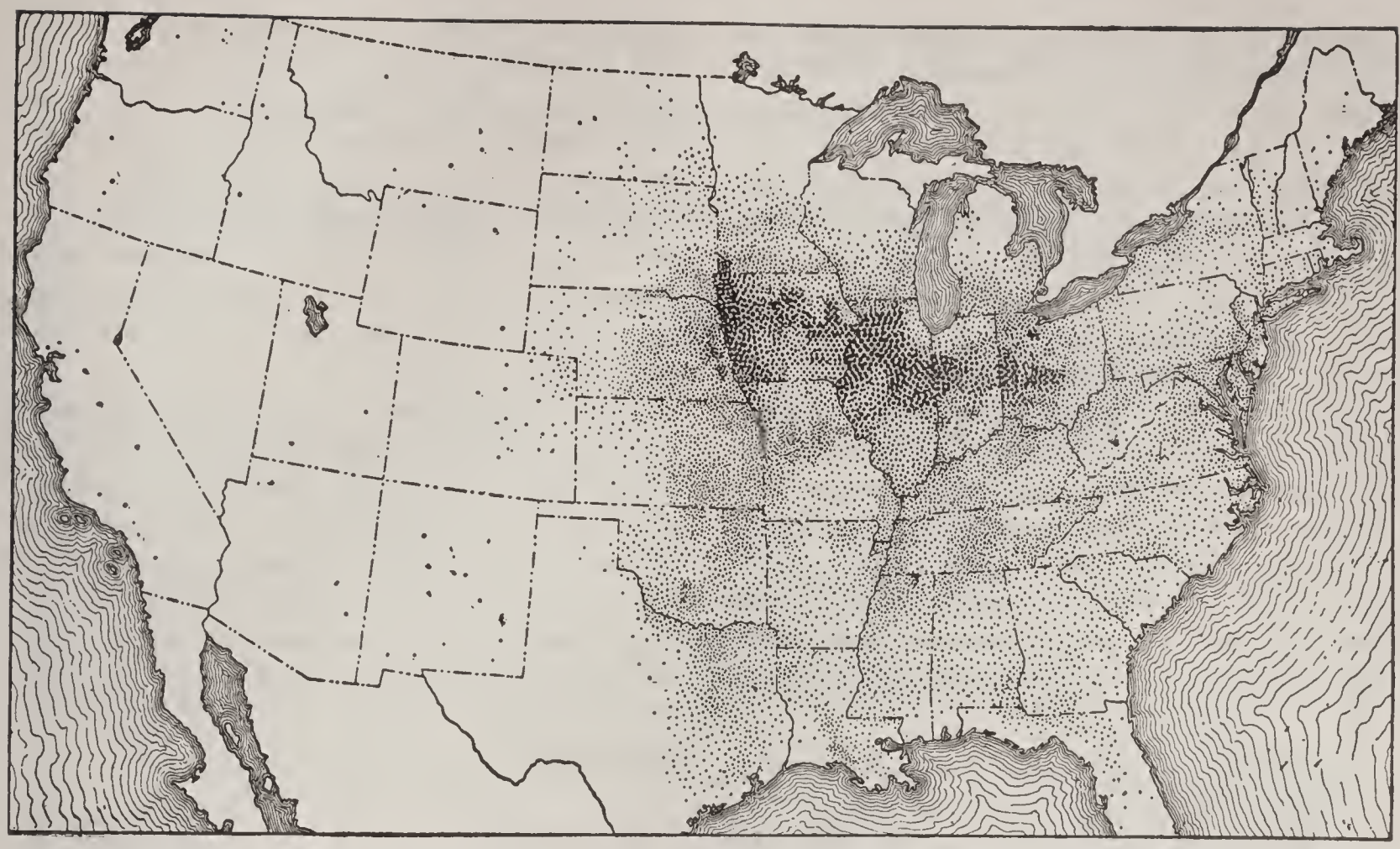
Corn thrives best in rich, black soil, and may be heavily manured without danger of causing the stalks to break down, as with the other cereals. Where crop rotation is practiced corn is usually planted on clover or grass sod, while most of the farm manure is also applied to the corn crop rather than to the wheat or to the oat crop. About 160 days is required for the largest yield of corn, but in most of the corn belt of the United States the season is shorter than this—varying from 160 days in Kentucky to 100 days in Wisconsin.

After the corn is up it requires about three to four cultivations to keep down the weeds; after the plants are large enough to shade the ground thoroughly, no further cultivation is given. From the middle of July to the end of August corn makes its most rapid growth, developing the ears during that period; it is very essential that the weather be hot, with plenty of clear sunshine and with two or three heavy rains.

A total of twelve to fifteen inches of rainfall is required to produce a good crop. Corn is ready to be picked or cut and put into shocks to cure about September 15, or if left standing the ears may be gathered any time after November 1. Usually the corn harvest is complete by the last of December.

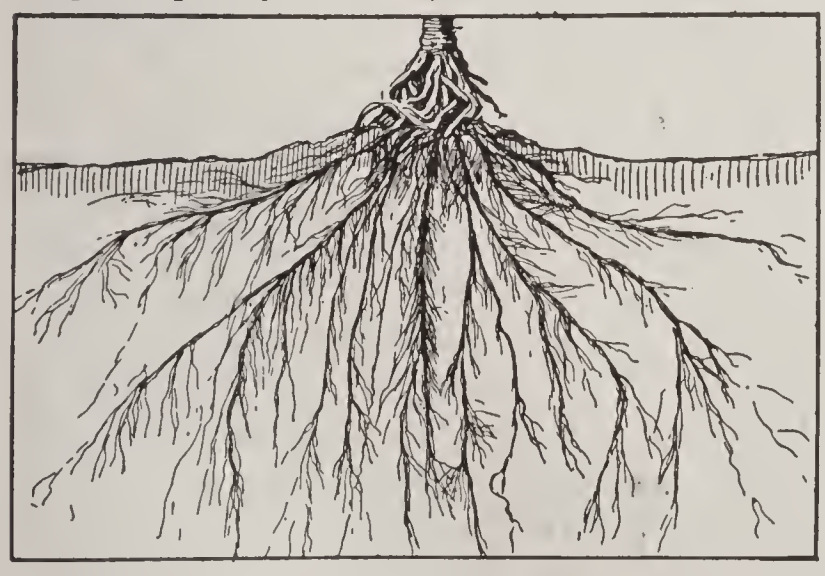
Methods of Harvesting. Corn is cut on a small scale by the use of a swordlike blade operated by hand, but on large farms up-to-date machinery is made to perform the labor of harvesting. One type of corn binder cuts, binds and discharges the standing corn as fast as the horses walk, performing from five to eight times as much work per day as a man would do. Very ingenious picking machines have also been devised, which greatly facilitate the work and also save time. Economical farmers utilize both the stalks and the ears. In putting corn into shocks the stalks should be set vertically, with only sufficient slant towards the common center to make them stand securely. Too much slant makes it possible for the shock to become water-soaked.

Cost of Production. The United States Department of Agriculture has made a survey of the cost of corn production and has furnished statistics that should be of interest to the agriculturist. It was found that the necessary expense of producing a crop is nearly as great for a small yield as for one double its size; and that the profits from a field yielding eighty bushels per acre are over twice as great as those from one producing forty bushels. Therefore the value of the corn crop will increase in proportion as methods of production improve. Farmers receive the highest returns from their labor who produce the largest crop per acre. A study of the illustration *The Farmer and the Nation* accompanying the article AGRICULTURE will show that Canada leads the countries of the world in average production per acre, that New Zealand is second, and the United States third.



AREAS OF GREATEST PRODUCTION IN THE UNITED STATES

Corn Products. Although rice feeds more people, corn may be regarded as of equal importance, as it yields a larger number of products than rice. Every part of the corn plant has its particular use. The stalk, the leaves, the pith and the fiber, apart from the cob and kernels, all have important commercial value. From the cob is obtained a pulp that makes excellent material for stuffing mattresses; the cob also provides pipes which are considered among the best and coolest by experienced smokers. From the pith of the stalks a paper of good quality is made, and it is also used in



HOW THE ROOTS PENETRATE THE SOIL

the manufacture of guncotton and smokeless powder, and as packing behind the armor plate of battleships. This packing is found very effective; if the armor plate is pierced, the pith swells and stops the resulting leak. It is possible that at no far-distant day the entire stalk will be utilized in the manufacture of paper.

An oil which is extracted from corn flour by pressure is important in the manufacture of cheap rubber. *Corn oil* is also used as stock food, mixed with meal. Many millions of bushels of corn are annually made into *starch,* both as food and for laundry purposes. *Glucose* is another product of corn, and is widely used in the manufacture of confectionery, preserves and jellies. *Alcohol* in great quantities is made from corn by distillation, a bushel producing more than two gallons of ninety-five per cent pure spirit (see subhead *Coming Uses for Stalks,* below). The gum, or adhesive mixture, used on the back of United States postage stamps is *dextrin,* also a product of corn and used, as well, in the manufacture of glue. The leaves of the corn plant are employed for packing fruit and making mats; and in the corn belt and other districts where the expense of hauling coal is great, corncobs provide a considerable part of the family fuel, three tons of cobs being equal to one ton of hardwood.

Of the corn raised in the United States more than four-fifths is used for stock food on the farms producing it, corn being both a cereal and a forage plant. About thirteen per cent of the crop is utilized in the manufacture of different products, among them being syrup, cooking starches, alcohol, laundry soap, glucose, sugar, paste, oil, rubber and many other important articles of commerce. The amount

exported is only one or two per cent of the total, while the corn consumed in towns and cities, except when used in manufacturing, is only two per cent of the total crop.

Coming Uses for Stalks. Chemists announce that every hundred pounds of cornstalks can be made to produce slightly more than one gallon of alcohol. In not harvesting his stalks for such economic use the farmer, where a market is not too distant, allows a great deal of wealth to go to waste. One acre of ground yields ten to twelve tons of stalks, or the equivalent of 1,200 pounds of alcohol, or 200 gallons. The wholesale price, by present methods of production, is about forty cents per gallon. If all the alcohol possible were derived from the nation's cornstalks the price would drop until it would compete with gasoline as a fuel. The United States Department of Agriculture declares that the alcohol so derivable would run all automobiles, trains and steamboats, would heat and light all houses and illumine the streets of every city.

It is more than possible that experiments already extending over several years will result in developing a process of manufacturing printing paper from cornstalks. When one considers that every time a great Sunday newspaper is now printed a small forest is destroyed to produce the paper, it is evident that the day is not far distant when a substitute for wood must be found to feed the paper mills.

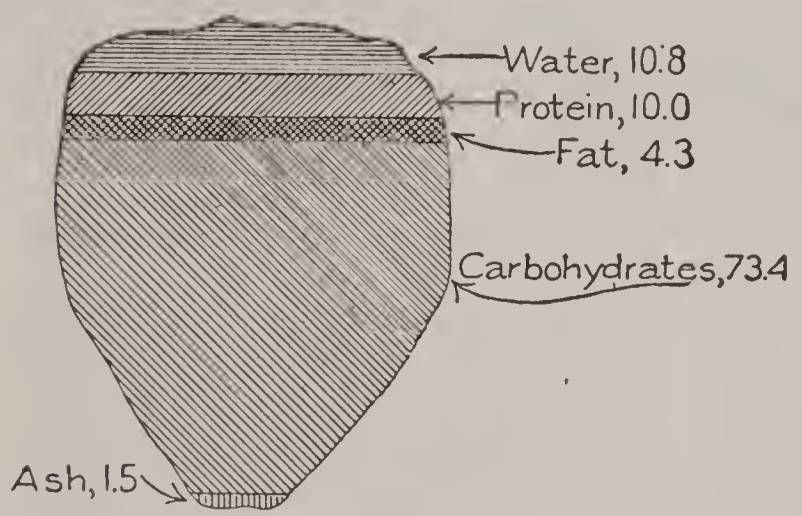
Food Values. All varieties of corn are very nutritious, richer in albumenoids than any other cereal. A mixture of rye and corn meal makes excellent bread; corn-meal porridge is nourishing; corn-meal biscuit, called locally "johnnycake," is the delight of many families.

As human diet all preparations of corn flour have high food value. The composition of corn is nearly twelve per cent water; ten per cent protein; 73.4 per cent carbohydrates, with a fuel value of 1,645 calories per pound. Pop corn has a value of 1,875 calories per pound, corn cereals, 1,680 calories, and parched corn has even a higher value, 1,900 calories per pound. The average home-cooked corn biscuit has a value of 1,920 calories per pound. Green corn boiled in the ear possesses little of the food value of the flour preparation, giving only 550 calories per pound (see CALORIE; FOOD).

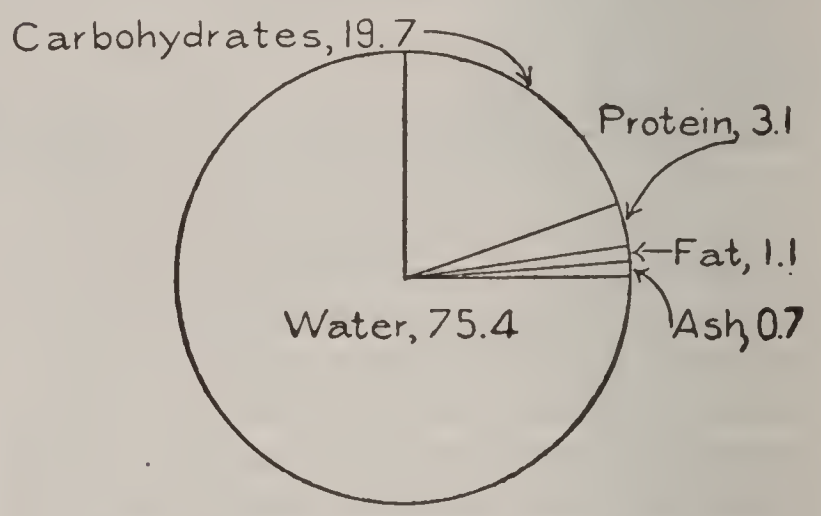
Boys' Corn Clubs. The boys' corn-club movement in the United States is an outgrowth of the Farmers' Coöperative Demonstration Work, inaugurated in 1904 under the auspices of the United States Department of Agriculture. In recent years the importance of awakening in the boys an interest in farm life and its problems has been widely realized, and this movement originated in the desire to create such a love for rural life that the number of youths who yearly left the country for the cities would be greatly diminished. The work was definitely organized in 1909, and at the present time the enrollment in the clubs of the various corn states is about 55,000.

The corn-club work is managed by the demonstration workers, the county superintendents of public instruction and the rural teachers, and the boys follow the directions and instruction given in the circulars and bulletins sent out by the United States Department of Agriculture, under the personal supervision of the demonstration workers. The superintendents and teachers organize the school-boys over ten years of age into clubs; the parents furnish land, teams and tools; public-spirited citizens in the community provide the prizes; and the publicity work is taken care of by the local papers. The boys follow a uniform plan in all their work.

The general plan is to have each boy cultivate one acre of corn, thereby becoming a



COMPOSITION OF DRIED CORN



COMPOSITION OF GREEN CORN

OUTLINE AND QUESTIONS ON CORN

Outline

I. History

(1) Grown in tropical contries
(2) The wild *teosinte* of Mexico
(3) Adaptation to northern latitudes
(4) Widespread growth

II. Varieties

(1) Pop corn
  (a) Peculiarities
(2) Dent corn
  (a) Commonest variety
  (b) Great production in United States
(3) Flint corn
  (a) Grown farther north than other varieties
(4) Sweet corn
(5) Flour corn
(6) Size of plants and ears

III. Importance of Corn

(1) World's crop
(2) Where chiefly grown
  (a) United States greatest producer
  (b) The "corn belt"
(3) Varying uses
  (a) As food
  (b) As forage
  (c) In paper-making
  (d) In manufacture of alcohol
  (e) In rubber-making
  (f) Miscellaneous uses

IV. Method and Cost of Production

(1) Manner of planting
(2) Of cultivating
(3) Most favorable soil and weather conditions
(4) Method of harvesting
(5) Cost of production
  (a) Small increase in cost with increased production per acre

V. Food Value

(1) Of corn flour
(2) Of green corn

VI. Corn Clubs

(1) Purposes
  (a) To diminish trend from farm to city
  (b) To teach new and better methods
  (c) To introduce corn-production in new territory
  (d) To vitalize work in rural schools
(2) Method
  (a) Competition
  (b) Special instruction

Questions

What makes pop corn pop?

Is there any difference in the method of planting corn intended for ensilage and that grown for the ears alone?

How much alcohol could be manufactured yearly if all the cornstalks of the United States were used in its manufacture?

Have you ever counted eleven rows of corn on an ear? Are you ever likely to?

Which has greater food value, "corn on the cob" or corn bread?

How much time is required for corn to mature?

Which is the correct style of corn shock, that with a broad base and very sloping sides, or that which has almost vertical sides and a narrow base? Why?

What other common plants belong to the same general order as corn?

How large a proportion of the United States corn crop is used as forage?

If you spoke in England of *corn,* what misunderstanding might arise? How could you prevent this?

What is the ordinary corn of commerce called, and why?

If you had a sandy field and one with a rich black loam, which would you choose for your corn?

What are the three greatest corn-producing states in the American Union?

How does Argentina's production compare with that of the United States?

competitor for various prizes. The state, district and county championships are determined on about the following basis:

(1) Greatest yield per acre	.30
(2) Best showing of profit on investment	.30
(3) Best exhibit of 10 ears at county, district or state fair	.20
(4) Best written history or account, entitled "How I Made My Corn Crop"	.20
Total score	100

The prizes include free trips to fairs, educational institutions and state corn shows, land, farm implements, thoroughbred farm animals, banners and pennants, tools, poultry equipment, camping outfits, books, subscriptions to magazines, etc. Probably the most desirable awards in the eyes of the boys are the free trips to Washington, D. C., but scholarships in agricultural colleges are also highly prized.

The practical benefits resulting from the corn-club movement are eminently worth while. In 1910 Secretary Wilson publicly stated that he gave the boys' corn clubs a considerable degree of credit for the great increase in the production of corn in the South during that year. The boys find in their acre of land a laboratory where they gain practical information about soil building, selection and testing of seed, cultivation of the grain—in fact everything pertaining to the growing of corn. They acquire a love for the soil and an appreciation of the importance of agriculture as an industry. They develop habits of close observation, accuracy and systematic application, and they learn to rely on themselves and to adapt themselves to emergencies.

The contests stimulate in these boys a wholesome spirit of competition, and at the same time widen their interests. The social side of life is cultivated by rallies and other meetings, and the bond between the boy and his home is greatly strengthened, because he is doing something that is of vital interest to the family. More than this, the work of the clubs is being more and more correlated with the work in the rural schools, resulting in a vitalizing of the course of study and the creation of a greater interest in school activities. A boy in one of the Southern states produced in 1914 a total of 229 bushels on his acre of ground, and this so far as is known is the highest yield ever known. See Boys' and Girls' Clubs.

History. Corn is of distinctly tropical origin, while most of the other cereals seem to have originated in the north temperate zone. There is good evidence that the culture of corn began in Southern Mexico at least 2,000 or 3,000 years ago, and spread from there to other parts of North America and to South America. In Mexico there is a native wild plant known as *teosinte,* which can be crossed with corn, thus showing a close relationship. Teosinte has very small, poorly-developed ears, but it is altogether probable that corn was developed from it, or from a close relative. By selection man has developed the fine, large ears and the great number of varieties that are known to-day.

Corn was not known in Europe until it was brought from America by Columbus. It was apparently cultivated by all tribes of Indians in America; the ease with which it was grown and preserved made its culture possible by them. For the same reasons it was adopted by the white people emigrating to America, and from the first has been one of the most important crops in the United States.

If we attempt to account for the enormous production of corn in the United States, it will be found that it is due principally to the ease and cheapness of production, and to its being an intertilled or hoed crop which alternates well with small grain crops in the practical management of a farm. Pound for pound the grain is not superior to other cereal grains as feed, but is produced more cheaply. E.D.F.

Consult Montgomery's *Corn Crops;* Shamel's *Manual of Corn Judging;* Rankin's *Studies of Corn and Its Uses.*

CORNEILLE, *kawr na'i,* Pierre (1606-1684), known as the father of the French classical tragedy, a domain in which he has possibly been equaled, but not surpassed. Born in Rouen, he was admitted to the bar at eighteen years of age, but his poetical instincts led him away from the legal profession. In 1629 his first comedy, *Mélite,* was played in Paris, where it met with great success. Seven years later, *Le Cid,* his first great classical drama, was produced. From 1629 to 1674 Corneille wrote thirty-three plays, eighteen of which are strictly tragedies and the others lyrical operas, tragedy-ballets and comedies.

CORNEILLE

In his day public taste demanded heroic men and deeds and extraordinary adventures, and his great inventive powers were applied to creating situations for the manifestation of heroic energy.

CORNELIUS, *kor na' le oos,* PETER VON (1783-1867), a German painter, whose work was of importance because of its influence on the development of modern German art. In 1811 he went to Rome, where he formed an association with Overbeck, Veit and others of the "Nazarene painters," so called because of their devotion to Christian art. Cornelius and his associates were asked to decorate a room in the house of the Prussian consul, and in so doing revived the long-neglected art of fresco painting. On his return to Germany he made the designs for the celebrated frescoes in the museum of sculpture at Munich, and in 1825 became director of the Munich Academy and was ennobled. Later he painted the colossal *Last Judgment.* See FRESCO.

CORNELL, *kor nel',* **UNIVERSITY,** one of the largest universities in the United States, located at Ithaca, N. Y. Its establishment introduced a new era in higher education. It was founded to carry out the ideal of Ezra Cornell, who, in offering $500,000 as an endowment fund, made the memorable statement, "I would found an institution where any person can find instruction in any study." Cornell was thus the first of the universities to recognize the more plainly practical needs of students, without neglecting the classical ideals. To Mr. Cornell's fund were added the proceeds from the sale of public lands granted New York by the Federal government, and the university was incorporated in 1865 and formally opened three years later.

Andrew D. White (which see) became its first president, while such scholarly men as James Russell Lowell, Louis Agassiz, George William Curtis and Bayard Taylor showed their approval of the ideals of the new institution by joining the faculty as non-resident professors. Since its organization the university has received many generous gifts, including $1,175,000 from Henry W. Sage, and at the present time its income is over $3,000,000 a year. Since 1872 the university has been a coeducational institution. The campus of Cornell is one of the most beautiful in the world. It is situated on a hill overlooking Cayuga Lake, and commands a view of a picturesque valley, beautiful cascades, and deep gorges cut by Fall and Cascadilla creeks. A splendid playground and athletic field of fifty-five acres lies to the east of the campus, and on the waters of Cayuga Lake the famous Cornell crews practice for the great university rowing contests.

The university departments comprise the graduate department, the college of arts and sciences, the college of law, the medical college, one of the greatest colleges of agriculture in America, the New York State Veterinary College, the college of architecture, the college of civil engineering and the Sibley College of Mechanical Engineering and Mechanic Arts. The total registration in all departments during the regular session is about 5,700, while 1,500 enroll for the summer sessions. The faculty numbers about 750. Practically one-tenth of the students are women. Undergraduates are given in their freshman and sophomore years a course in military drill under the direction of an officer of the United States army.

Cornell University stands for the newer democracy which, though it recognizes the static value of precedent, believes that the dynamics of life come not from the fathers but from environment. In expressing this democracy the following may be said:

(1) Cornell was the first Eastern university to give full liberty in the choice of studies;

(2) Before Cornell got its charter, with the exception of a state university in the West, all colleges were sectarian and denominational, and since its foundation no professor has been excluded from the faculty because of his religious or political views;

(3) The founder's scheme in admitting women to academic equality with men was another expression of this democracy;

(4) The final goal was reached in the trustees' legislation on April 29, 1916, admitting members of the faculty to the board of trustees, for the first time in university history in the United States.

Ezra Cornell (1807-1874), the liberal-spirited founder of the university, was born in Westchester County, N. Y. He received only a common-school education, and early in life worked as potter, carpenter and mechanic. In 1826 he removed to Ithaca, N. Y., where for eight years he managed a flour mill. Becoming interested in the construction of telegraph lines, he invented a machine for laying the wires underground; when this proved impracticable he made the suggestion, which was adopted with great success, of stringing the wires overhead. In 1855 he helped found the Western Union Telegraph Company, and it was in connection with telegraphy that his

large fortune was acquired. The public library of Ithaca, as well as the great university that bears his name, is a memorial of his generosity. H.A.H.

CORN FLOWER. See KAISER-BLUME.

CORN'ING, N. Y., county seat of Steuben County, is in the southwestern part of the state. It is on the Chemung River, a branch of the Susquehanna, and on the Erie, the New York Central, and the Delaware, Lackawanna & Western railroads. Elmira is sixteen miles southeast, and Buffalo is 134 miles northwest. The city covers an area of nearly three square miles. In 1910 the population was 13,730; in 1920 it was 15,820.

In the country about Corning tobacco is raised extensively, and the city is one of the principal tobacco markets of the state. Coal is mined near-by. Cut and flint glass, railway supplies, pneumatic drills, air compressors, terra-cotta articles, tile and brick and wagons are manufactured on a large scale. The Corning glass works is one of the largest factories of its kind in the world.

The important public buildings are a city hall, public library, Federal building, Corning hospital, courthouse and city club. Corning Free Academy supplements the city public schools. St. Mary's Orphan Asylum is an important institution in the city.

There was a settlement on the site of Corning in 1789, but it was not incorporated as a town until 1848. It then received its present name in honor of Erastus Corning, a capitalist and railway builder. A city charter was granted in 1890, and revised in 1905. F.J.S.

CORN LAWS, in English history, is the name applied to certain laws, dating back to about 1360, in the reign of Edward III. They were passed to regulate the trade in grain. In England, wheat or any other grain used for food is called corn, and the name does not refer to maize, or Indian corn. In the early period laws were passed forbidding farmers to ship their grain out of the country, the object being to prevent a scarcity of the supply necessary for home use. Later, duties were placed on grain imported into England, and these had become very burdensome by the time of Queen Victoria's accession to the throne in 1837, for they raised the price of food and worked great hardship to the poor people.

About 1839 an anti-corn-law movement was started; the agitation was carried on for several years, aided by the zeal and eloquence of John Bright and Richard Cobden, and by a crude poet, the "Corn-Law Rhymer," who stirred the people with such lines as these:

> England! what for mine and me,
> What hath bread tax done for thee?
> Cursed thy harvest, cursed thy land,
> Hunger-stung thy skill'd right hand.

Finally, Sir Robert Peel, the Conservative Prime Minister, yielded to the popular outcry, and in 1846 Parliament repealed the unpopular corn laws, an event which marked the beginning of England's policy of free trade. See COBDEN, RICHARD; BRIGHT, JOHN.

CORNS, small spots of hardened cuticle which usually appear on the outside of toes, but sometimes in softer masses between them, or on the sides or the balls of the feet. They are caused by continued pressure or friction at those points; in other words, a shoe that is either too tight or too loose may produce them. The horny appearance of these patches suggested the name *corn,* from Latin and French words meaning *horn.* Corns of the *fibrous* form are cone-shaped, but since pressure of the shoe prevents outward growth, they sink into the skin, causing pain and often serious changes in the formation of joints. *Soft* corns usually appear between toes and are often painful ulcerations which need careful attention.

Removal of the cause, namely, tight or ill-fitting shoes, is the first step toward a cure. Frequent foot baths in warm water and cutting away the cuticle bring relief, but cutting must be done so carefully that the knife will not penetrate the soft tissues beneath. Application of glacial acetic acid night and morning is an excellent remedy. Professional men and women who through study are qualified to treat corns are called *chiropodists.*

CORNWALL, *kawrn'wall,* the county town of Stormont County, Ontario, on the Saint Lawrence River, fifty-six miles southeast of Ottawa and sixty-eight miles southwest of Montreal. The Saint Lawrence at this point passes through the Long Sault Rapids, which steamers avoid by using the Cornwall Canal, eleven miles long, from Cornwall to Dickinson's Landing. The town is also on the Grand Trunk and the Ottawa & New York railways. Cornwall has abundant electric and water power for its manufacturing industries, of which the chief products are furniture, including chairs and bedsteads, cotton goods, pulp, paper and lacrosse supplies. Its lacrosse team is one of the most famous in the Dominion. In the vicinity of Cornwall is a mixed farming region, but lumbering, as indicated by the manufac-

tures, is also important. Stanley Island, eight miles away, is a summer resort. Population of Cornwall in 1911, 6,598; in 1921, with suburbs, 7,419.

CORNWALLIS, *kawrn wal'is,* CHARLES, Marquis (1738-1805), a British general who showed considerable ability in his campaigns against Washington in the American Revolutionary War, but was finally outgeneraled and compelled to surrender at Yorktown on October 19, 1781. In England, at the outbreak of hostilities, he openly expressed his opposition to the war, but sailed with his regiment in compliance with orders. He took a prominent part in the Battle of Long Island and pursued Washington through New Jersey. At Trenton a detachment of his Hessians was captured in 1776, and at Princeton in 1777 he again suffered defeat. He retrieved his losses at Brandywine on September 11, 1777, and secured command of the Delaware River. Disgusted at the lack of coöperation given by Howe, he tendered his resignation, which was not accepted. His surrender at Yorktown made the triumph of the American cause a certainty.

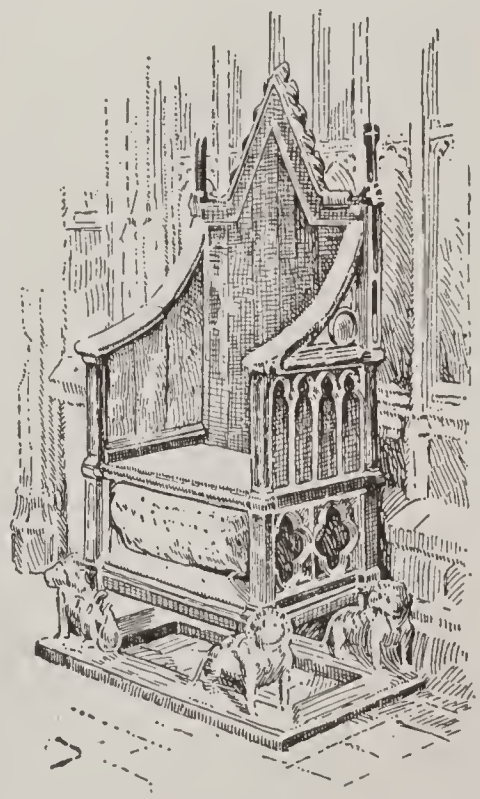
LORD CORNWALLIS

In 1786 Cornwallis was appointed commander-in-chief and Governor-General of India, where he performed brilliant service. He was afterwards appointed Lord-Lieutenant of Ireland, but in 1805 returned to India, where he died.

CORONA, *ko ro'na,* a Latin word, meaning *a crown.* In astronomy, it is applied to a crown, or circle of light, encircling the sun, but only visible during total eclipses, and even then only for a few seconds. The name is also given to an appendage of certain flowers between the corolla and stamens. This is well illustrated by the cup of the narcissus. Another use of the term is found in architecture, the corona being the upper projecting part of a cornice.

CORONADO, *ko ro nah'doh,* FRANCISCO VASQUEZ (about 1500-1549), a Spanish explorer, born in Salamanca, a province of Spain, who sailed to Mexico in 1535 and married Doña Beatriz, the daughter of Estrada, the royal treasurer of New Spain. He thus became a leading *grandee,* or high official, at the viceregal court in Mexico. The Spaniards at this time were hearing stories of seven wonderful and immensely rich cities, called the Seven Cities of Cibola, which Marcos de Niza, one of the Spanish monks, claimed to have discovered on an earlier expedition. On February 23, 1540, Coronado started out with an army of Spaniards and Mexican Indians in search of the reported wealth. On their journey they discovered the Canyon of the Colorado and then marched northward, reaching a point near the boundary of Kansas and Nebraska. In the spring of 1542 they returned to Mexico, greatly vexed at finding no wealthy cities.

CORONA'TION, the act or ceremony of crowning a sovereign, as a king or emperor, at which he is publicly invested with the insignia of royalty. Edward the Elder, crowned in 901, is said to have been the first English monarch to adopt the ceremony, being girt with the sword, lifted into the throne, and presented with the Bible, the spurs and the orb, or globe, which is part of the regalia of a ruler. The ceremony is religious as well as political, and is usually performed by a high Church official—in England by the Archbishop of Canterbury. In most countries a solemn pledge, known as the coronation oath, is exacted from the new sovereign as a preliminary to coronation. The ceremony is often deferred on account of time needed for the magnificent preparations, often taking months to accomplish, and invitations are extended to monarchs of other countries.



ENGLAND'S CORONATION CHAIR

The "stone of destiny" is seen below the seat.

Coronation Chair, the ancient chair made of oak by order of Edward I, to enclose the famous "stone of destiny" that he brought from Scotland, on which the kings of that country had been crowned for cen-

turies. Round the stone, which legend says is the one that was used as a pillow by Jacob, appear these words, engraved upon it:

If fates go right, where'er this stone is found,
The Scots shall monarchs of that realm be crowned.

The chair is kept in Westminster Abbey and is covered with cloth-of-gold when moved out before the altar as a seat for a sovereign of England when he is crowned.

COR'ONER, an officer in each county of every state or province, whose principal duty it is to investigate the cause or manner of death of persons who die suddenly or are slain, or about whose death there appear to be unusual or suspicious circumstances. The law requires that a physician who cannot certify to a death from natural causes shall report the case to the coroner's office for legal investigation. In some states the statutes give justices of the peace local jurisdiction in the coroner's absence. A jury of six men is impaneled by the coroner or justice to make inquiry and ascertain, if possible, the cause of death. If indications of foul play are discovered, the report made contains the names of the persons possessing knowledge of the deed, if they are known, and this forms the basis for issuance of warrants for arrest. Coroners receive no salary except in very large cities, their remuneration nearly always being fees for time actually spent in the pursuance of their duties.

COROT, *ko ro',* Jean Baptiste Camille (1796-1875), a French artist, whose fame rests chiefly on his unique landscape paintings, in which the sweet and tender aspects of nature are pictured in browns, pale greens and silvery grays, producing an effect of delicate loveliness that gives his works the name of "painted music." Corot loved to paint the mists of dawn and the shadows of evening, and his pictures seem usually to be enshrouded in an atmosphere of haze. Several examples of his work are permanently in the New York Metropolitan Museum; one of them is the lovely *Ville d' Avray,* in which the soft and mellow color of dawn is relieved by a faint touch of rose in the sky, and by gleams of yellow and blue in the costumes of the women.

COROT

Corot found inspiration for much of his painting in the beautiful forest of Fontainebleau; near this forest lay the village of Barbizon, which has given its name to the school of landscape painting of which he was called the "lyric poet." Among his best-known canvases are *Dance of the Nymphs,* which is faithfully reproduced in color on the opposite page; also *In the Woods, Rouen, Evening* and *Souvenir d' Italie.* The latter, one of the most valuable of his paintings, was sold for about $44,000. He also painted religious pictures, among which are *Baptism of Christ* and *Flight into Egypt.* See Barbizon Painters.

CORPORAL, *kawr' po ral,* a title given to the holder of the lowest non-commissioned rank in all armies. A man may be promoted direct from the ranks to what is commonly called *full corporal,* or he may be placed on probation as a *lance corporal.* In all armies a corporal's duties are the same. He takes charge of guards and fatigue parties, and has his definitely-appointed place in drills. The War of the Nations which engulfed Europe in 1914 greatly added to the responsibility of corporals and other non-commissioned officers, due to the surprisingly-large losses of officers of commissioned rank. Promotions were necessarily rapid.

CORPORAL PUNISHMENT. In the school days of our fathers, the ferule and the beech rod were considered to be an essential part of every teacher's equipment, for whipping was common in all schools below college rank. It was generally believed that whipping and other means of inflicting bodily pain were necessary to secure the obedience of children, both in the home and the school. This idea has been handed down from one century to another since the days of Solomon, who said, "He that spareth the rod, hateth his son: but he that loveth him chasteneth him betimes."

It is only since the middle of the nineteenth century that the evils of corporal punishment have received careful consideration. Since parents and educators have learned more about child nature, they have discovered that corporal punishment almost invariably has an injurious effect upon the child. It arouses his antagonism, and at best secures only an outward semblance of obedience. In most states and provinces corporal punishment in the public schools is now greatly restricted or

DANCE OF THE NYMPHS

DANCE OF THE NYMPHS. If there is something unreal and dreamlike about most of Corot's paintings it is not because he did not know how to paint nature as he saw it. It was because he preferred the mist of the dawn or the silver haze of late twilight to the harsh, brilliant light of noonday, and threw over his landscapes a delicate veil that makes them seem part of a lighter, airier world. His quiet life was reflected in his pictures, for he chose to paint no raging seas, no storm-torn trees or lowering clouds. He cared not at all for the melodramatic in art, but chose usually to picture some quiet lake bordered with soft trees, or a grass-grown slope or meadow with patches of shade and of sunshine.

Frequently, as in this picture, he introduced figures, but they partake of the airy, dreamlike character of the landscape. The question is not so much one of correct drawing and of accurate proportions as of artistic blending—do the figures add to or detract from the general effect of lightness and charm? And in practically every instance Corot was able to answer this question satisfactorily and to make his nymphs or bathers as much a part of the picture as the softly blurred leaves of the trees.

L. J. B.

entirely prohibited by law, and most of the large cities have abolished it, even where permitted by law. We have learned that suppression is not discipline, that the truest discipline consists in willing and free action along right lines. H.K.S.

CORPORATION, *kawr po ra'shun,* a corporate body created by law, distinct from the members who comprise it, having a special name and capacity for acting as a single individual. It has been defined as a fictitious person. The corporation is immortal, in the legal sense that it can be made capable of indefinite duration; it may sue and be sued in its corporate name; it may acquire property, and—under certain limitations—borrow money; and finally, it has the power to elect officers and to adopt by-laws for the detailed regulation of its business.

Usually, at least three or five persons may form a corporation by applying to the state authority for a charter. In the United States and Canada the amount of property that may be held by a corporation is frequently limited in the act or charter which authorizes its existence. At one time or another about one-half the states of the American Union levied a general corporation tax, which is a fixed rate either on the capital stock or on the earnings of all corporations doing business in the state. Nearly all of the states have abandoned this form of taxation, especially since corporations are subject to the Federal income tax.

Public Corporations. Public corporations are those created for the purposes of government, as counties, cities, towns and villages. For example, a community may become an incorporated village, or a village may incorporate as a city, by meeting conditions laid down by the state legislature. These public corporations may be dissolved or changed by action of the state legislature, subject to the restrictions of the state constitution, and they may sue and be sued, as individuals.

Private Corporations. Private corporations consist of four classes. Those in the first class are not organized for profit of the members; there is no capital, and the object is amusement or philanthropy or other uncommercial object. The second, or joint-stock corporation, is formed for the financial gain of individual members; the third is organized for mutual aid and relief, and the fourth, known as incorporated trusts, has a fund set apart for special purposes, such as colleges, hospitals and charitable associations.

Joint-Stock Corporations. The joint-stock corporation is organized by the stockholders, who meet and choose a board of directors, varying in number from three to over twenty. These directors in turn choose the officers responsible for the daily conduct of affairs, and fix their salaries. Each man who invests in such a business receives certificates of stock, and usually each stockholder has as many votes as he owns shares of stock. Those holding the largest amount of stock are generally chosen directors, because of their larger interest. Often it is true that the officers who manage the routine affairs are only small stockholders, but are chosen for their recognized ability. As a rule, any person owning fifty-one per cent of the stock can elect the officers and control the policy of the corporation. The division of corporation capital into shares affords opportunities to both small and large investors, and the transferability of the securities makes it possible for stockholders to join or leave the corporation at any time, simply by transferring stock. The corporation may owe money, but the members as individuals are under no obligation to pay the debt; the debts are obligations of the company and not of the individuals composing it. In this respect a corporation differs radically from a partnership (which see). If, however, an individual has not paid up his stock in full he is liable for the amount unpaid; in some states holders of bank stock may be assessed double their holdings, in case of failure of the bank.

Corporations in Commerce. The advantages derived from corporations undoubtedly have led to greater economy in production when large resources are combined in manufacture. They have enlarged the facilities in traveling; have cheapened such communications as the telegraph and telephone service; have reduced the cost of life and fire protection, and in many other ways have benefited all the people. These advantages, on the other hand, have in a measure been offset by forcing many smaller producers out of the business field. In some instances, too, the standards of business were for a time lowered, for frequently the power of immense capital has been used in questionable ways, but for years a high standard has been approached. Such objections have less weight now than formerly, for it has become a part of the business of the general government to regulate all large corporations. See TRUSTS; INTERSTATE COMMERCE ACT; FEDERAL TRADE COMMISSION. W.B.C.

CORPORATIONS, Bureau of. See Commerce, Department of; Federal Trade Commission.

CORPORATION TAX. See Income Tax, subhead *Tax on Corporations;* also, see Tax.

CORPUS CHRISTI, *kawr'pus kris'tee,* Tex., noted as a resort and shipping point for seafood, had a population, chiefly American, of 8,222 in 1910; it had increased to 10,522 in 1920. Of this number twenty per cent are Mexicans and two per cent negroes. The city was founded in 1838, was incorporated in 1852 and received its name from the Latin, which signifies *body of Christ.* Its area is nearly five square miles.

Corpus Christi is the county seat of Nueces County and is situated on the southwestern coast of the state, on Corpus Christi Bay, at the mouth of the Nueces River. Brownsville is about 150 miles south, Laredo is 150 miles west and San Antonio is 150 miles northwest. Railway facilities are afforded by the Texas & Mexican, the San Antonio & Aransas Pass, the Gulf Coast Lines and the San Antonio, Uvalde & Gulf railways. There is also steamer connection with Galveston. A reinforced concrete causeway connecting Nueces County with San Patricio County, on the opposite side of the bay, was completed in January, 1916, at a cost of $165,000.

The maintenance of the city is largely dependent upon tourists and the agricultural products of the district. A fine harbor attracts considerable coasting trade. Corpus Christi has extensive fishing and oyster-packing industries, cigar and tobacco factories, machine shops, a cotton compress and a cotton-oil mill. The $250,000 county courthouse, a $500,000 hotel and the national bank are the most notable buildings. A library adds to the educational advantages offered by a public school system, a Roman Catholic Academy and a business college.

Corpus Christi adopted the commission form of government in 1908. E.N.F.

CORREGGIO, *kor red'jo,* the name by which Antonio Allegri (1494-1534) is popularly known, was an Italian painter, master of the art of foreshortening (which see), to give figures the appearance of motion. He was unrivaled in the handling of light and shade and in the beauty of expression and grace he gave his figures. Antonio was born at Correggio, near Modena, and the name by which he was known was that of his birthplace. Among his best productions are his decoration of the main dome of the cathedral at Parma, called the *Assumption of the Virgin* and regarded as his masterpiece; *Night,* now in the Dresden galleries; and *Saint Jerome, Marriage of Saint Catharine,* and the *Penitent Magdalene.* He also produced several exquisite Madonnas, and the altarpieces of *Saint Francis, Saint George* and *Saint Sebastian.*

CORRELA'TION. A farmer who desires to raise wheat succeeds best in a wheat country; one desiring to raise corn finds another section the most desirable location, and one choosing to raise cotton must locate in the warmer states. Each of these locations is adapted to the crop named because the soil and climate of the locality are especially suited to the respective plants. This fact leads to the conclusion that there is a very close relation between agriculture and geography. There is a like relation between geography and history, between history and literature, between geography and geology, and so on. Arranging subjects so that pupils will study them in their true relations to each other is *correlation.* Correlation increases interest in the subject studied and enables pupils to gain a more thorough and practical knowledge of the various branches pursued. It is receiving constantly increasing attention among educators.

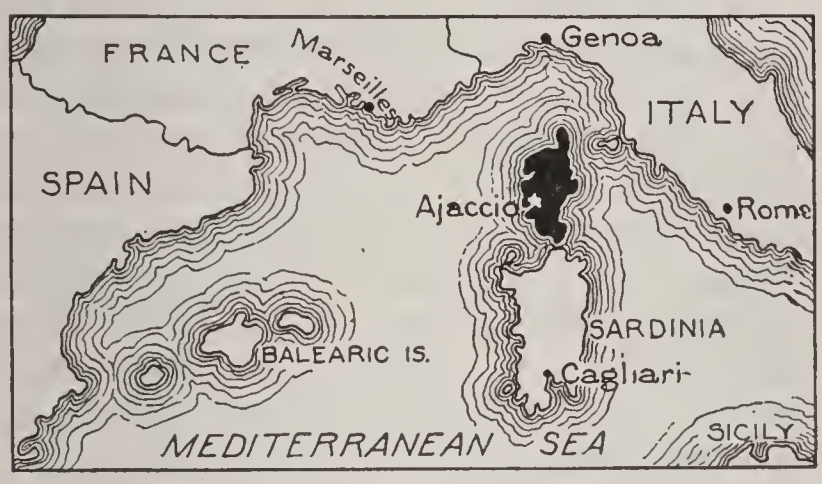
CORRESPOND'ENCE SCHOOLS. See Schools, subtitle *Special Schools.*

CORRIGAN, *kor'ri gan,* Michael Augustine (1839-1902), a prelate in the Roman Catholic Church in America, noted for his scholarship, administrative ability and liberality. He was born in Newark, N. J., was graduated at Mount Saint Mary's College (Maryland) in 1859, and in the same year was one of the first twelve students to enter the new American College at Rome. He was ordained in 1863, shortly afterwards became professor at Seton Hall, South Orange, N. J., and was made president of the institution in 1868. He was elevated to the office of bishop of Newark in 1873, holding this position until 1880, when he was called to be coadjutor of Cardinal McCloskey, archbishop of New York, receiving then the title archbishop of Petra. In 1885, upon the death of Cardinal McCloskey, he became archbishop of New York.

CORROSIVE SUBLIMATE, *ko ro'siv sub'li mate,* or Bichloride of Mercury, a compound of mercury and chlorine, in the form of white crystals. It is soluble in water and is used by surgeons to disinfect wounds and by taxidermists to protect skins from insects. Cor-

rosive sublimate is a most violent poison, and careless people, taking it by accident under the belief that they are swallowing headache medicine, are sometimes killed by it. The best antidote is the white of an egg, with which it forms an insoluble compound. In case of poisoning from it a physician should be called at once, and a strong emetic as well as the white of an egg should immediately be administered to the patient.

CORSICA, *kawr'si ka,* the fourth in size of the islands of the Mediterranean Sea, and a dependency of France. It is situated about 100 miles southeast of the French coast and a less distance west of Italy, and is separated



LOCATION OF CORSICA

Map shows its position with respect to the cities of Marseilles, Genoa and Rome, and the location of the capital, Ajaccio.

from Sardinia by the Strait of Bonifacio, nine miles wide. It covers an area of 3,367 square miles, a little less than the combined areas of Delaware and Rhode Island. The island is famous at the present time chiefly as the birthplace of Napoleon and as the original home of the vendetta and of brigands, but it was anciently an important spot. The days of brigandage have passed, but the vendetta, a feud which may last for generations, still is maintained by the passionate, vengeful inhabitants of the more isolated mountain regions.

The climate is ever mild, and the soil is fertile, producing olives, fruits, grain and vegetables. There are extensive forests of pine, oak, cork and chestnut trees and well-cultivated vineyards the source of brandy and wine of good quality. Chestnuts form an important article of food among the peasants. Iron, lead and copper are mined, and there are valuable quarries of alabaster, marble and granite. Labor is scarce, but at harvest time many men and women are imported from the mainland. The capital is Ajaccio, a flourishing city, and terminus of the island railway system.

The island was first colonized by the venturesome Phoenicians, who named it *Cyrnos.* The Romans captured it and gave it the present name. From the Romans it passed to the Goths, then to the Saracens, who held it until the fifteenth century. The Genoese then became its masters, and ceded it to France in 1768. In 1795 it came by force of arms into British possession. The French succeeded in recapturing it in 1796, and have since retained undisputed possession. Population in 1921, 281,959. See, also SARDINIA.

CORSICANA, *kawr si kah'na,* TEX., the county seat of Navarro County, fifty-three miles southeast of Dallas, is the center of an extensive oil industry. It is on the Houston & Texas Central, the Saint Louis Southwestern and the Trinity & Brazos Valley railroads, and on the Southern Traction line. The city has a Federal building, courthouse, Carnegie Library, a natatorium, several sanatoriums, an Odd Fellows' Widows' and Orphans' Home, an Elks' Home and the state orphan asylum. In the vicinity are a great number of oil wells, two large refineries and oil-machinery factories. The city has large cotton mills, gins and compresses, cottonseed oil mills, sheet-metal works, foundries and machine shops, flour and planing mills, and manufactories of brooms, harness, soda-water, candy and overalls. The population in 1910 was 9,749; in 1920 it was 11,356. The area of the city is three and one-half square miles.

CORTES, *kor'tes.* See SPAIN, subhead *Government.*

CORTEZ, or **CORTES,** *kor'tez,* or *kor tays',* HERNANDO (1485-1547), a Spanish adventurer of the reign of Charles V, who, lured by the hope of winning golden treasure, achieved lasting fame as the conqueror of Mexico. He began his career of adventure in 1504, when he sailed for the West Indies. Having distinguished himself in crushing a revolt of the natives in Santo Domingo, he was appointed chief assistant of Velazquez in the expedition sent to Cuba for the conquest of that island, and so impressed his superior officer with his energy, daring and supreme ability as a fighter that the latter made him commander of a fleet which he was fitting out for a voyage to the

CORTEZ

mainland of America in quest of gold. When Velazquez subsequently repented of his act and planned to give the command to another, Cortez took matters into his own hands and before his chief could prevent him, set sail from Santiago, on November 17, 1518. When finally assembled, his fleet consisted of eleven vessels, manned by a force of about 700 men.

Early in the spring of 1519 the expedition landed at the port of San Juan de Ulloa, on the coast of the Gulf of Mexico. A little north of this place the Spaniards laid the foundations of the town of Vera Cruz, which they called the "Rich City of the True Cross," and there, having renounced his allegiance to Velazquez, Cortez burned all but one of the vessels of his fleet, so that no one would be tempted to desert him. The one vessel which remained carried messengers back to Spain to tell the king of the things that had been done, and to ask his permission to continue the work of conquest.

Leaving a garrison of soldiers at Vera Cruz, Cortez led a small company overland toward Mexico, the capital city of the Aztecs, which they reached on November 8, 1519, after being joined by two tribes nearer the coast. The Spaniards were graciously received by Montezuma, the great emperor of the Aztecs, but when Cortez and his soldiers assumed the high-handed manner of conquerors, the Mexicans plotted to drive them from the city. As soon as he learned of the conspiracy, Cortez seized Montezuma and held him as a hostage, forcing him to deliver a vast quantity of gold and precious stones.

Later the people revolted against both their emperor and the Spaniards, and in the course of the uprising Montezuma was killed, while the invaders were driven out of Mexico City and pursued for six days, suffering great loss throughout the retreat. Finally, on the plain of Otumba, Mexicans and Spaniards came to open battle, and on July 7, 1520, Mexico was won for Spain. Cortez at once began to reinforce his army with men from the neighboring tribes, and on August 13, 1521, he recaptured Mexico City, after a spirited siege of several months.

In recognition of his services to Spain, Charles V made Cortez governor and captain-general of Mexico, but in 1528 the conqueror was summoned to Spain to answer charges made by his many enemies. Though the charges failed to crush him, for the king received him like a royal guest and created him Marquis of the Valley of Oaxaca, still when Cortez returned to Mexico he was deprived of his civil authority, his property was kept from him, and he was treated with scant consideration. In 1536 he discovered the peninsula of Lower California, and three years later returned to Spain to ask from Charles V a restoration of his rights. In this he was disappointed, and after passing several years in shameful neglect, he died near Seville, Spain. B.M.W.

The most vivid account of the conqueror is contained in Prescott's *Conquest of Mexico.* Consult, also, *Cortez and the Conquest of Mexico,* in "Heroes of the Nations" Series.

CORT'LAND, N. Y., the county seat of Cortland County, thirty-six miles south and west of Syracuse, twenty miles northeast of Ithaca and 250 miles northwest of New York City. It is on the Tioughnioga River, and the Delaware, Lackawanna & Western and the Lehigh Valley railroads. The population in 1910 was 11,504; in 1920 it was 13,294. The area is over four square miles. There are a number of Italians and Russians, grouped in their own communities, within the town.

Cortland is situated in the pleasant hill and valley country of Central New York. It has important manufactures of wire cloth, among the largest of their kind in the world, and screens, nails, etc. One of the largest mills employs between 1,200 and 1,500 men. Motor trucks, wall paper, silk, automobile parts, forgings, machinery, emery wheels and canned goods are other products. The Cortland State Normal and Training School, the Franklin Hatch Library, the Federal building, and a Y. M. C. A. building are prominent structures. The town was first settled in 1792. It was a part of the town of Homer until 1829, when it was separated and made the county seat. In 1900 Cortland was chartered as a city. R.A.F.

CORUNDUM, *ko run' dum,* next to the diamond, the hardest mineral, and the one which when transparent is known as the *amethyst,* the *ruby* and the *sapphire.* Corundum is a compound of aluminum and oxygen, and notwithstanding the lightness of aluminum (which see), corundum is four times heavier than water. The name comes from the Hindu word *kurand,* and it is supposed that the stone was first imported into Europe from India. There are many varieties of corundum; a coarse granular variety forms emery (which see). The precious stones named above come only from the transparent varieties, and their vary-

ing colors are due to their mixture with different minerals in small quantities. See AMETHYST; RUBY; SAPPHIRE.

COSHOCTON, *ko shok' tun,* OHIO, the county seat of Coshocton County, with a population, chiefly American, of 10,847 in 1920, an increase of 1,244 since 1910. It is situated a little northeast of the geographical center of the state, at the point where the Walhonding and Tuscarawas rivers unite to form the Muskingum; it is also on the Ohio Canal. Zanesville is twenty-six miles south, Columbus is sixty-five miles southwest, and Cleveland is 115 miles north. Railway transportation is afforded by the Pennsylvania and the Wheeling & Lake Erie railways. Bridges connect with Roscoe, on the opposite bank of the river. The area is nearly two square miles.

Coshocton is built on four broad terraces, the upper one having an elevation of 824 feet above sea level, affording a fine view of a beautiful valley. It is the center of a gas, coal and oil region and a shipping point for coal, grain, live stock, flour and wool. The principal industry is the manufacture of advertising novelties and signs; four of these companies employ 1,000 people. Automobile and glass factories and flour and paper mills are important establishments. In addition to the public school system, with two high schools, the city has a Carnegie Library.

Coshocton was the name of the chief village of the Turtle tribe of Delaware Indians, on the site it now occupies. The first white settlement was made in 1801; in 1802 the town was laid out and named Tuscarawas, and it became the county seat in 1811, when the present name was adopted. It was incorporated in 1833. Indian mounds and ruins of forts dating to Revolutionary days are features of historical interest. D.G.G.

COSMOS, *koz' mos,* an interesting, late-blooming garden annual. Brought into the United States from Mexico, its native home, the cosmos has not yet become fully accustomed to short seasons, but it bravely bears the chilly autumn winds, and blooms often as late as November. The large, late varieties grow six to ten feet high, and are bushlike, with feathery leaves. On graceful, slender stems, the lovely, yellow-centered flowers, somewhat like single dahlias, but more delicate, brighten the fence-sides and borders with their white, pink, or crimson beauty. The dwarfs grow only about four feet high and bloom as early as July. In a light soil, not too rich, and in a rather sunny spot, cosmos plants will prove very decorative.

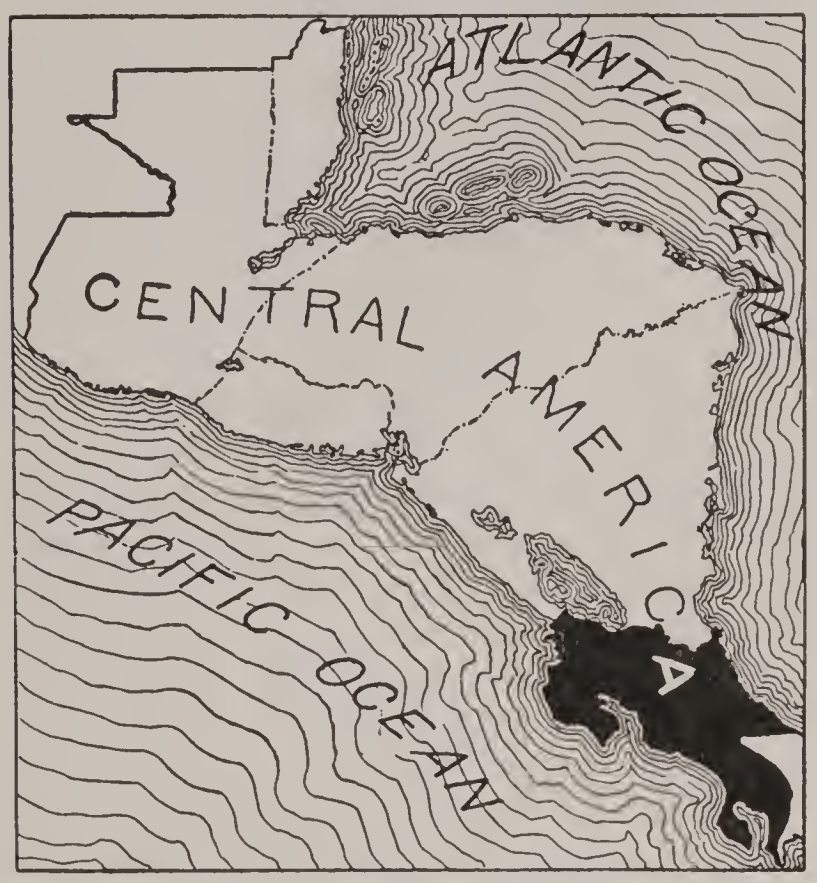
COSMOS

COSSACKS, *kos' aks,* the name of a class of people who inhabit the southern and eastern portions of Russia, and who were regarded by the Russian czars as a very important military division of the population. The name comes from the Turkish word *kazak,* and means *robber.* The origin of the Cossacks is not definitely known. When they first attracted notice they were dwelling on the islands in the Dnieper and on the banks of the Don and the Bug rivers, and consisted largely of men who had fled from their nations or tribes because they wanted greater freedom. The government was tribal and allowed the greatest freedom to the individual. The tribes were loosely organized into a little republic. In 1549 the Don Cossacks, or Cossacks of the Don, submitted to the czar, but were independent in all local affairs. In 1593, when serfdom was established in Russia, their number was greatly increased. They do not form a distinct nationality, but a community, distinct from other Russians because of their manner of life and local government. Their present number is about 3,000,000.

The Cossacks have long borne a reputation for cruelty, reckless daring and skill in horsemanship and in the use of arms, and when called upon by the czar to suppress insurrections they always proved themselves merciless agents of despotism. These bold and hardy troops performed military duty instead of paying taxes, and formed the greater part of the cavalry of the Russian army. Each cavalryman was required to furnish his own horse. They wore a uniform of dark green and carry short magazine rifles. Some were also armed with long lances. The Cossacks rendered valuable service to the Russian government in the first two years of the War of the Nations.

COSTA RICA, *kahs' ta re' ka,* the most southerly of the Central American republics, lying between Nicaragua and Panama and a member of the new Central American Federation, organized in 1920. It covers an area of 23,000 square miles, and is therefore

about half the size of the state of Pennsylvania. Perhaps the most remarkable features relating to Costa Rica are that it is a peaceful country, seldom disturbed by such revolutions as are current among its northern neighbors; it takes great pride in its educational facilities, and its schools have more students than there are men in its army and police force. Costa Rica has conscientiously tried to develop



LOCATION OF COSTA RICA
The map shows, also, the proportions of Central America occupied by its southernmost republic.

a national spirit of progress and enlightenment, under the guiding hand of the white element. Native Indians do not gain the ascendency, as in some republics of Latin America.

Surface and Climate. The country is traversed by a range of volcanic mountains, which form a link in the gigantic chain extending from Alaska to Cape Horn. Some peaks rise to a height of 10,000 and 11,000 feet. Earthquakes occur frequently, but only two of its volcanoes, Irazu and Turrialba, have shown recent signs of activity. From the Atlantic and the Pacific coasts the land slopes upward to a plateau, the gradual ascent of which marks distinct variations in climate. Below an elevation of 3,000 feet is the torrid zone; from 3,000 to 7,000 feet is a temperate zone, and above that again is a much colder region in which frosts are frequent, though snow is scarce. The climate is healthful and fevers occur only in a few low-lying districts.

Resources. Costa Rica is essentially an agricultural country, and nearly every adult male is a landholder. Under a carefully-planned system the government allots land to applicants on advantageous terms, but in no case in larger lots than 500 hectares (1,235 acres). This plan has done much to increase the efficiency of agriculture. The most profitable product is the banana, of which millions of bunches are annually exported. Next comes coffee, which is of excellent quality and in demand in all markets. Sugar, cacao, rice and corn are also grown, but only for local consumption. Stock raising is carried on, and the forests are yielding an increasing quantity of lumber. Silver, gold and copper are mined and exported in considerable quantities.

Population. The total population in 1921 was 468,373. The ruling class consists of the descendants of old Spanish colonists. The native Indians are of a peaceful and industrious nature and live in harmony with the whites. There are also about 6,000 foreign-born residents, chiefly German and Spanish. The religion of the state is Roman Catholic, but religious liberty is guaranteed all creeds.

Government and History. The President is elected for four years and, strangely enough in Central America, holds the office for the full period without fear of uprisings to unseat him. He is assisted by a council, also elected for four years, numbering one member for every 8,000 inhabitants. The capital is San José, and there are two important ports, Punta Arenas on the Pacific coast and Limon on the Atlantic. Limon is rapidly developing into a modern little city; in 1913 its population was 7,012. San José is described elsewhere in these volumes.

Costa Rica was discovered and named by Christopher Columbus in 1502, but was not colonized until thirty years later. Until 1821 it formed part of Guatemala, but then became a part of Mexico. In 1921 the United States demanded that Panama concede to Costa Rica a boundary previously established by arbitration by Chief Justice White. For its history, see CENTRAL AMERICA. F.ST.A.

Consult Palmer's *Central America and Her Problems;* Calvo's *The Republic of Costa Rica.*

COSTIGAN, *kos'ti gan,* JOHN (1835-), a Canadian political leader, for forty years one of the most influential members of the Dominion House of Commons and since 1907 a Senator of the Dominion. Though born in Quebec, at Saint Nicholas, his early political career was in New Brunswick, where he sat in the legislature and also held a minor judgeship.

From 1867 to 1907 he represented the county of Victoria, N. B., in the House of Commons; this is a longer continuous term of service than has fallen to any other member. During this period he was Minister of Inland Revenue under Sir John A. Macdonald, Secretary of State in the Thompson administration, and Minister of Marine and Fisheries in the Bowell and Tupper Ministries. In 1896 he left the Conservative party and gave his support to the Ministry formed by Sir Wilfrid Laurier. The tenth anniversary of his service in the Senate was January 15, 1917.

COS'TUME. With all school lessons, we find that those studies which we can really *use* are most valuable. Science teaches how to govern our countries, and how to profit by the experience of others. Geography teaches about climate and crops and about the things that different people do for a living, in different parts of the world. Arithmetic teaches about business and money, about weights and measures, and how to keep accounts. All of this knowledge is necessary to boys and girls who expect to succeed in the work they plan to do.

Fig. 1
Fashion Plate Cut Out and the Shape Traced

Fig. 2
The Shape Traced

Fig. 3
Head, Hands and Feet Cut Out and Pasted in Position

Fig. 4
Dress Shape Traced on Colored Paper

How to Apply Art Knowledge. We should make our art lessons useful, also. It is a great accomplishment to be able to paint pictures, but that is not the most important thing that we may learn from the study of art. A few people seem to be born with a genius for painting pictures and for carving or modeling statuary and for designing wonderful buildings. These few, gifted as they are, will paint our pictures, carve our statues and design our great buildings. We must try to understand their work so that we may appreciate and enjoy the most beautiful things in the world, even though we cannot ourselves produce them. But for the great majority of people art can do more than to try to teach picture-painting. Art can help us to dress better, to furnish our houses in better style, to lay out our gardens attractively and to understand how color and form and arrangement are necessary in working out problems in housekeeping and in business.

Every girl, and every boy, too, likes to look well. It is really a pleasure to feel that one is dressed neatly and appropriately. Looking well, in this sense, has little to do with looking fashionable or appearing to be expensively dressed. "Costly thy habit as thy purse can buy" is a safe motto; but that "habit"—which means dress or costume—can be selected with taste and judgment, whether it costs little or much.

It is therefore a good thing to study in school and at home that kind of art which concerns dress, or costume. It is true that we cannot always buy the clothes that we would like; but we can learn a great deal about clothes, so that when we do buy, or when we

have a chance to select, our taste and judgment will be worth something.

The fashion sheets that are supplied without cost by firms that have patterns to sell provide the best material for study of prevailing styles and costumes, and colored papers are as beautiful to work with as dress goods and trimmings. It is most interesting to select a costumed figure from a fashion sheet, and use it as a basis for a design in color. Let us see how a problem of this kind can be solved.

An interesting figure, shown in black and white, was selected from a fashion sheet. The figure was carefully cut out, exactly as one would cut out a paper doll (Fig. 1). The cut-out figure was then placed on a sheet of heavy

Fig. 5
Method of Tracing Trimmings

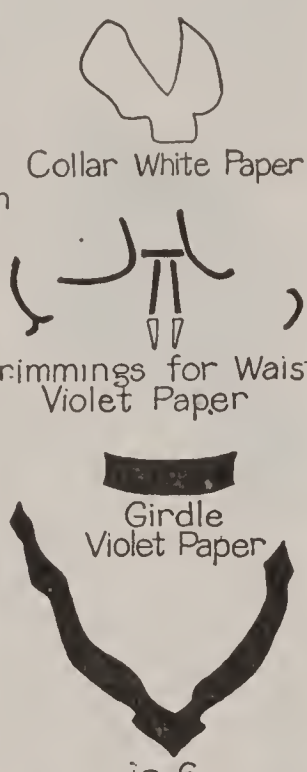


Fig. 6
Tunic Band Violet Paper

white paper, such as drawing paper or water color paper. A tracing was made on the white paper, with a soft, well-sharpened pencil, resulting in an outline as seen in Fig. 2. The head, hands and feet were then cut from the original figure, and these parts were pasted in their places on the tracing. The tracing on white paper then appeared as shown in Fig. 3. The traced figure already begins to take on great interest, for the young lady appears to be dressed all in white. We might make a number of modifications on this white costume, if we chose. We could add a girdle, collar, yoke, or various trimmings of lace, embroidery or ribbons, if we wished to carry out the design in white. As our first intention was to design a costume in color, however, we will proceed to the use of colored papers. Let us select a pale yellow, or straw color, for the gown, with trimmings of violet.

To obtain the shape of the dress, lay the figure from which head, hands and feet were cut (Fig. 1), over a sheet of pale yellow paper. Trace around this shape, as shown in Fig. 4. Cut out the traced shape, and paste it on the

Fig. 7 Method of Tracing Hat Shape

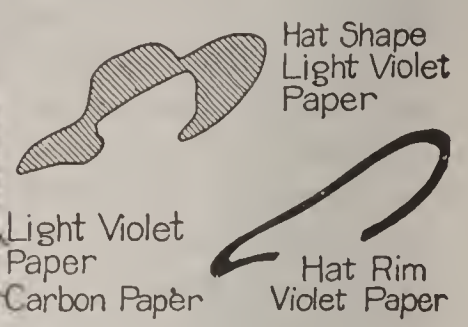


Fig. 8

white figure. The lady no longer appears dressed in white; she has donned a gown of pale yellow; but the yellow dress seems plain and unadorned. Here, again, we see in fancy a dozen different styles of trimming. On this same yellow foundation and with a variety of colored papers we could work out a variety of interesting color schemes. When working with papers, we can make several color combinations and select the scheme we like best. If we were working in silks, chiffons and fine linen, this would not be practical. You see that paper costumes have certain advantages over actual costumes.

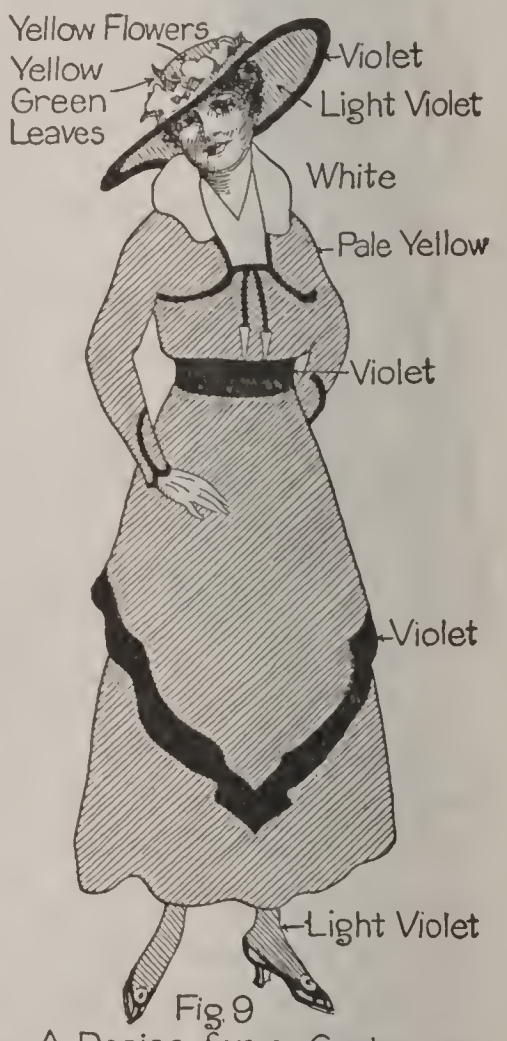


Fig. 9
A Design for a Costume
Expressed through Colored Papers

We select violet for the trimmings of our pale yellow dress. Lay a sheet of violet paper on your working board. On it place a sheet of carbon paper. Upon the carbon paper place the dress cut from the fashion plate. (See Fig. 5.) With a sharp pencil trace the shapes of girdle, tunic band, cuff and other trimmings. Cut out these various shapes, as shown in Fig. 6. Paste them neatly in their places on the pale yellow dress. Note the transformation.

Our dainty lady is now correctly dressed,

save for the hat. This still appears in black and gray. Let us select a light violet paper for the body of the hat. Place thin white paper over the head of the figure. Trace the shape of the hat and rim. This gives the outline shown above the carbon paper, in Fig. 7. Here is also shown the method of tracing the hat shape on light violet paper. Fig. 8 shows the shapes cut from light violet and violet papers. These shapes are pasted in position over the gray and black hat of the wearer. Flower shapes of intense yellow and leaf shapes of yellow-green should be added to the hat, to give the necessary finishing touch to the costume.

The completed costume, which we see in Fig. 9 only in black and white, gives but a faint idea of the color charm of this beautiful design.

As fashions change, our problems in costume design can be kept up-to-date by following the foregoing steps, with figures chosen from the current magazines or fashion plates. B.S.

COTES, *kotes,* Sara Jeannette Duncan (1862-), a Canadian journalist and novelist. As Sara Duncan she won a name for herself by letters and sketches of travel contributed to the Toronto *Globe* and other newspapers in Canada and the United States. After her marriage to Everard Cotes in 1891 she began to write novels, many of which deal with life in India, where for many years her husband was a correspondent. Among her most popular books are *An American Girl in London; Vernon's Aunt; The Simple Adventures of a Memsahib; His Honour and a Lady; A Voyage of Consolation; The Other Side of the Latch; The Pool in the Desert; The Consort; The Story of Sonny Sahib;* and *Cinderella of Canada.*

COTOPAXI, *ko to pak'se,* the loftiest active volcano and one of the most beautiful mountain masses in the world, in shape nearly a perfect cone. It is in Ecuador, on the eastern chain of the Andes Mountains, about forty miles south of Quito and sixty miles northeast of the peak of Chimborazo. The most recent estimate gives its altitude at 19,613 feet. Its crater has a diameter of 2,600 feet, with a depth of 1,500 feet. There have been many eruptions, the most recent of which occurred in 1903.

COTTON. Over 400 years before the birth of Christ the Greek historian Herodotus wrote about a marvelous land in Asia, from which travelers returned with stories of a tree that bore wool "exceeding in goodness and beauty the wool of any sheep." The "fleece-bearing tree" that called forth the praise of these travelers in the Far East was the wonderful plant from whose fibers much of the clothing of the civilized world to-day is made, and whose seeds furnish food for man, beast and soil; it is a plant deserving well to be called exceedingly good and beautiful, and to bear the title so often conferred upon it—"King Cotton." Since the days of Herodotus many have tolds of its merits, but none more eloquently than the Southern orator, Henry W. Grady, who said of it:

> What a royal plant it is! The world waits in attendance on its growth; the shower that falls whispering on its leaves is heard around the world; the sun that shines on it is tempered by the prayers of all the people; the frost that chills it and the dew that descends from the stars are noted; and the trespass of a little worm upon its green leaf is more to England than the advance of a hostile army on her Asian outposts. It is gold from the instant it puts forth its tiny shoot. Its fiber is current in every bank, and when, loosing its fleece to the sun, it floats a sunny banner that glorifies the fields of the humblest farmer, that man is marshaled under a flag that will compel allegiance of the world and bring a subsidy from every nation on earth.

Brooks in his *Story of Cotton* writes:

> Cotton to-day is the friend of the poor and the luxury of the rich. It is made into cloth so coarse that it sells for a few cents a yard. It is made into fabrics so fine and so beautiful that it can hardly be told from silk, and so heavy and so thick that experts can barely distinguish it from wool. It is made into rope and cord so strong

that it is almost the equal of flax or hemp, and into thread so fine that one pound will reach more than a hundred miles. Every year manufacturers discover new ways of preparing it, and every year the demand for it increases, and the world, it seems, cannot have enough of it. . . . . And if, through some calamity, we should lose all goods made entirely or partly of cotton, and if all people should be thrown out of employment whose occupation is, in any way, dependent upon it—whether in the cultivation, the manufacture, or the commerce—the civilized world would be all but naked, a large per cent of it would be hungry, and the homes would be bare and comfortless.

Distribution and Production. The cotton plant is a member of the mallow family, and the first cousin of the familiar roadside mallow and the stately hollyhock. It is distributed widely over the world within the thirty-fifth parallels north and south of the equator,

COMPARATIVE ANNUAL CROPS

The diagram shows that Texas produces more cotton than all India, that Georgia exceeds Egypt, and that Mississippi leads Russia. The figures represent production based upon an average of five years.

reaching its highest stage of development in the belt between 20° and 35° north latitude; within this area are found the cotton belts of the United States, Egypt and China, the three leading countries in its production.

India, Siberia, Brazil, Peru, Mexico, Asiatic Turkey and Persia also raise it in large quantities, and it is cultivated to a limited extent in Greece, Italy, the west coast of Africa, Argentina, Australia and the Pacific islands. The world's annual production of cotton is from 18,000,000 to 25,000,000 bales, from 10,000,000 to 16,000,000 being the output of the Southern United States. It is a warm-weather plant, and requires a moderate amount of rainfall; excessive rainfall and severe drought are equally fatal to its growth.

Varieties. Differences of soil, climatic conditions and methods of cultivation have tended to produce many different varieties of the cotton plant. There are variations in the height to which it grows, in the quality and length of the hairlike strands, or fibers, that form its lint, and in the color of the lint. Cotton fibers range in length from half an inch to nearly two inches, and it is the length and fineness of these fibers, not the size of the stalk, that determine the value.

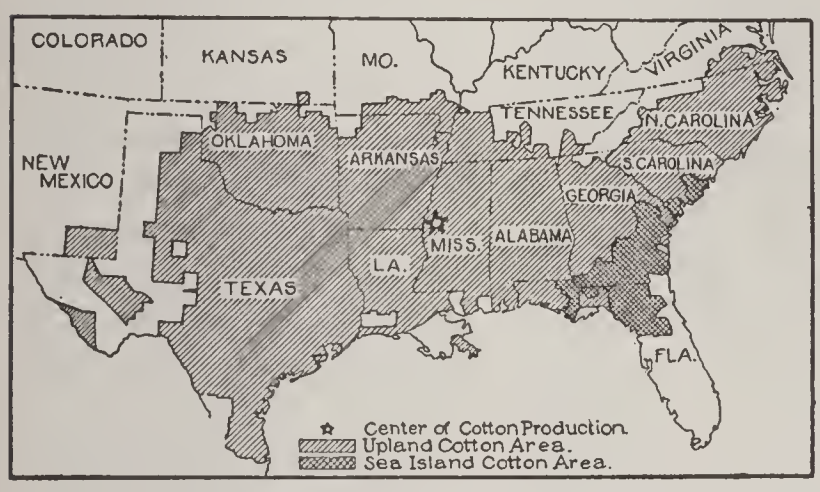
From a commercial standpoint the most important varieties are the *sea-island,* the *Egyptian,* the *Peruvian* and the *upland.* The sea-island leads all others in the length and quality of its fibers. These have an average length of 1.61 inches, and they are so fine that one pound can be spun into a thread 160 miles long. This plant grows to a height of twelve feet or more. It is cultivated most successfully along the coast region of South Carolina, Georgia and Florida, especially in the sea islands off the South Carolina coast. The South Carolina product is the choicest. Fine fabrics and laces and the finer grades of spool cotton are spun from the long, silky fiber of sea-island cotton.

Though the American South is the king of cotton-growing districts, about 300,000 bales of foreign cotton are imported yearly, to offset large exports. Of the foreign product, that from Egypt is the most important. Egyptian cotton is a variety of sea-island, but is less fine than the American product. Its fiber, which has an average length of 1.31 inches, is especially adapted to the manufacture of goods having a smooth finish and silky luster, and it takes the dye admirably. Its tawny color, however, is utilized in the manufacture of goods that require no dye, such as lace curtains of the natural ecru shade. The English people are working very hard to develop Egyptian cotton fields. Attempts are now being made to introduce Egyptian cotton into the irrigated districts of Arizona and into the Imperial Valley of California, but thus far without encouraging returns.

Peruvian cotton, known commercially as "Rough Peruvian," is reddish in color, and its fiber is rough and hairy, like that of wool. It is mixed with wool in making cloth and hats, and is also used in the manufacture of underwear and stockings. The United States imports about 30,000 bales of this variety each year.

Upland cotton comprises about two-thirds of the world's supply. It is the best-known of all varieties, and the cheapest, and as an economic factor is of supreme importance. Its fibers are short, not usually exceeding .93 of an inch; the stalk grows to a height of three or four feet. As this variety is the typical product of the "land of cotton," it is the one described in the following paragraphs.

In a Cotton Field of the South. At cotton-picking time the fields present a bright array of green and white, and from a distance the stalks look as if they were crowned with snowballs. These little balls of white are the



COTTON-PRODUCING AREA

precious store of the fruiting pod, or boll, and the fruit of the planter's labor that began months before. Late in the winter or early in the spring the cotton planter starts the plows to work in order to make the soil soft, fine and mellow. Then the ground is laid off in rows three to four feet in width, and made ready for the sowing.

Usually the seeds are dropped into a long, straight furrow made with a small plow. On the large plantations an improved cotton planter is used. This opens the furrow and sows and covers the seed, and as it is drawn by a mule or horse, like a plow, it requires the services of only one man, who can plant about eight acres a day. The date on which the preparation of the soil begins varies from January 15 in Southern Texas to March 5 in the Carolinas; sowing usually begins from March 10 to April 15 and lasts until the middle of May.

About ten days or two weeks after the seeds are planted the little shoots push their way out of the soil. These must be carefully cultivated, for cotton will not grow well if it is too crowded, or if weeds are allowed to intrude. Therefore the stalks are frequently hoed, and they are thinned out until they stand about a foot apart in the rows, with one stalk to a hill. Soon the plants put forth green leaves that look very much like those of the maple tree. Little buds, too, make their appearance, which, from their peculiar shape, are known as *squares*.

When the plant is perhaps a foot high, the squares open and disclose beautiful white blossoms, which turn to a delicate shade of pink on the second morning, because of the effects of the sun's rays. The third day they grow still rosier in color, and usually fall to the ground before night, leaving behind on the stalk a tiny green boll. Sometimes, when cultivation is neglected or weather conditions are unfavorable, the blossoms carry the bolls with them when they fall, and with them, too, are carried the hopes of the planter.

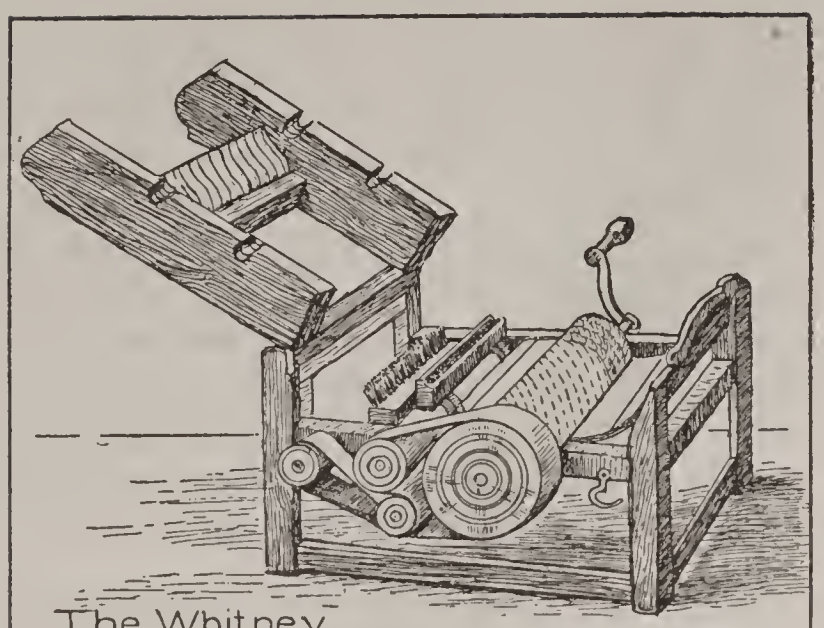
At the end of six or eight weeks the bolls are about the size of a hen's egg, and then, as if bursting with pride at their store of rich, white lint, they crack open, splitting into three parts and announcing that picking time is at hand.

This period lasts many weeks, because not all the plants ripen at the same time, and the pickers therefore make several rounds of the fields. Far to the South, the picking begins in July; it starts a little later farther North, and in the Carolinas is not completed until nearly Christmas. The white fleece pulled from the bolls is gathered into baskets or bags

IMMATURE COTTON BOLLS

which hang from the shoulders of the workers, and later is loaded on huge wagons to be carried to the establishment where it is made ready for the manufacturer.

Cotton picking is still done almost entirely

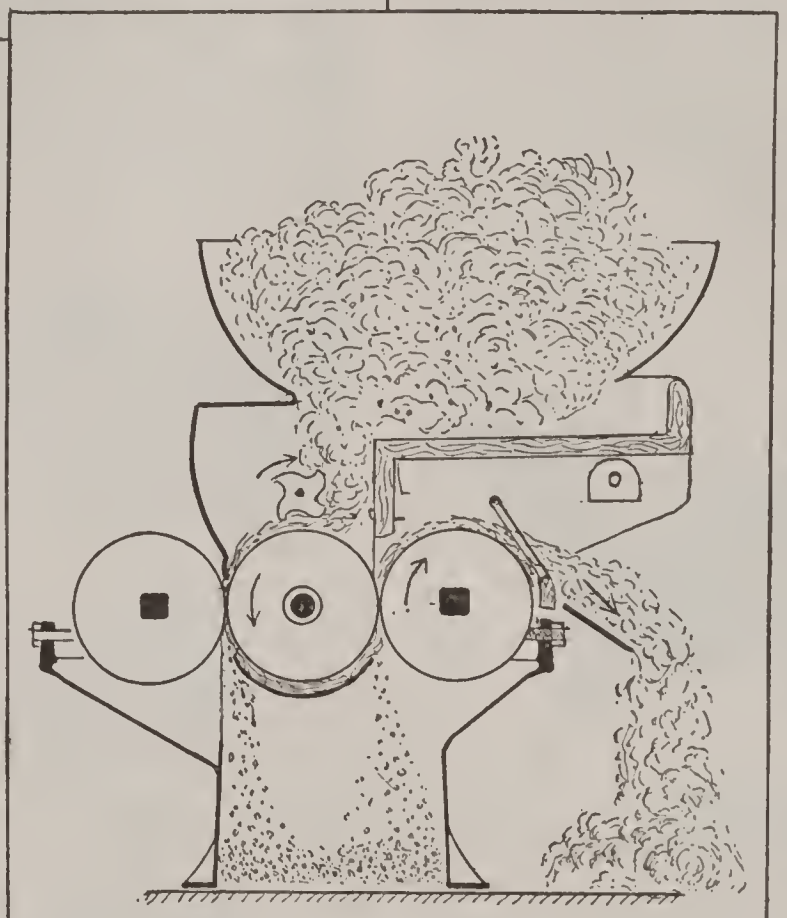


The Whitney Cotton Gin

by hand, as in the days before the War of Secession. Hand work is, however, expensive, the prices of labor ranging from forty cents to one dollar per hundred pounds. Experiments are now being made with a cotton-picking machine which will greatly lessen the expense for the large planters if it can be made to operate successfully on a large scale, as now seems certain. Improved methods of fertilizing the soil and of cultivating and handling the crop have been worked out by the agricultural experiment stations of the Southern states, from which the planter may always obtain valuable information.

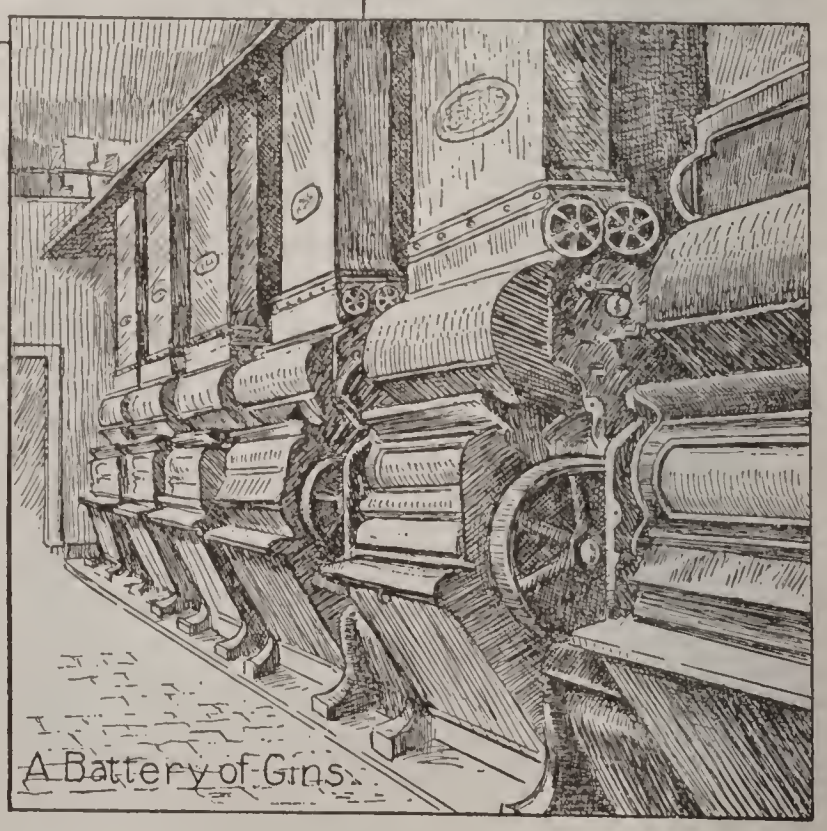
From the Cotton Field to the Market. The transformation of the fleecy white mass gathered from the bolls into the finished cotton fabric involves many operations. The lint which is dropped into the pickers' baskets has clinging tightly to its fibers numerous little hard seeds, all of which must be removed. The process of freeing the lint of seeds is known as *ginning,* and the machines, *cotton gins.* The public ginning establishments near the cotton plantations are operated by steam power, and some of them are equipped with four gins of seventy saws each, which clean from 2,000 to 3,000 pounds of cotton a day.

In the Ginning House. The wagons laden with the cotton from the plantations stop under a flexible pipe extending out from the mill. The lint is sucked up into the pipe by machinery and carried through fans which free it of dust and other impurities. It is then dropped into a gin, and after the seeds are removed the fleece is carried by machinery into great presses, where it is made into bales. The bales are wrapped in bagging and bound with iron bands, ready to be sent to the cotton mills. An American bale for the local trade is usually about four feet high, four feet wide and five or six feet long, and weighs 500 pounds. The bales shipped long distances are compressed again and are much smaller. A bale of cotton nets the planter from fifty to seventy-five dollars, in normal times.



Cross Section of a Modern Cotton Gin.

In the Cotton Mill. When the cotton arrives at the factory it is run through various machines which free it of dirt and form it into a *lap* or *roll.* It is then passed through rollers covered with steel wire points, a process which makes the fibers lie in straight, parallel rows, except as they curl or twist about other fibers. The curls and twists are straightened out in a



A Battery of Gins.

stretching frame, and the fibers are then twisted and wound on bobbins of decreasing size, until the strands are fine enough to be spun into thread or yarn. When the product is ready for the spinning machine it is called *roving*. From the spinning machine the thread or yarn is taken to the looms to be made into cloth. The details of these processes are described in these volumes under the titles SPINNING and WEAVING.

Muslin, silesia, cheesecloth, cambric, duck and canton flannel are some of the fabrics woven from cotton yarns. Plain cotton goods with printed designs are known as calico, and gingham is a fabric woven of cotton threads of different colors. Cotton yarn or cloth treated with a solution of caustic soda is said to be *mercerized*. In this process the fibers shrink a little and take the dye more readily, while the mercerized fabric acquires a glossy appearance like that of silk.

The By-products of Cotton. Both the seeds and stalks of the cotton plant are utilized. In the process of ginning, short, fine pieces of lint, called *linters,* cling to the seeds. These are used in making low-grade yarns, wrapping twine, cheap rope and lampwicks, mattresses, comforters, cushion pads and upholstering. Mixed with wool, linters enter into the manufacture of hats, and they are also utilized in making writing paper and guncotton.

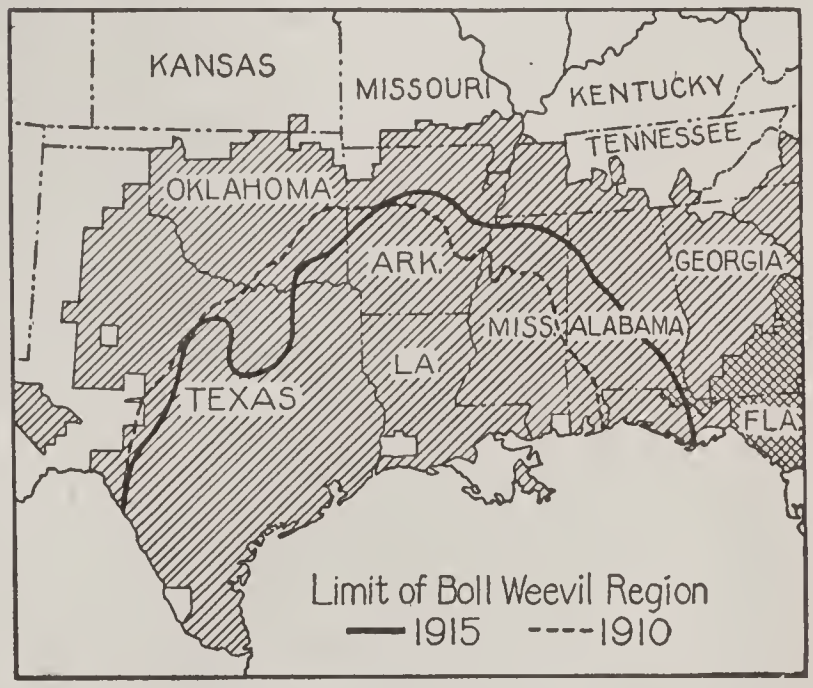
The hulls of the seeds, which are cut away from the kernels by machinery, are used in large quantities as a food for stock. The oil pressed out of the kernels has various uses. The better grade is used in making oleomargarine, cottolene and salad oil (see COTTONSEED OIL). Large quantities of the American product are shipped to Holland, where the oil is utilized in making imitation butter. The Italians, after putting it through various treatments, use it as olive oil; for several years they shipped it back to America as pure olive oil, and it was a long time before the deception was known. In France inferior grades are converted into soap. Cottonseed oil is also employed in packing sardines, and it serves as a substitute for linseed oil in paints. Miners value it as a fuel for their lamps, and druggists use it in the manufacture of medicine.

Another by-product is cottonseed meal, obtained by grinding the hard, dry cake left after the oil has been pressed out of the seeds. When sifted like flour it is an excellent stock food, and when mixed with acid phosphate it becomes a valuable fertilizer.

The cotton stalks are now being put to numerous uses. Cut up and worked into the soil, they are valuable as fertilizer. Pulp made from them is coming into extensive use in paper making, for paper manufactured from cotton pulp is much stronger in proportion to thickness and weight than that produced from wood pulp. The latter, also, is more expensive than cotton pulp, and is more difficult to obtain because of the diminishing timber supply.

Cotton stalk fibers have also been found practicable for the manufacture of guncotton. Cotton pulp which has been dissolved in amyl acetate is used in making artificial silk, the substance being spun into threads and the threads woven into fabrics. Numerous chemicals also are produced from cotton pulp, among which are pyroxylene, alcohol and acetone. What remains from the stalk after the fiber has been removed can be prepared as a food for stock, and umbrella handles are now being made out of the tougher portions.

The Enemies of Cotton. Of several insect pests that damage the cotton plant, the *boll weevil* is the most malignant. This is a small, gray beetle which attacks the growing bolls and renders their contents useless. The cotton leaf



BOLL WEEVIL MAP

worm, another pest, is the caterpillar of a gray moth. These caterpillars injure the plants by stripping them of their leaves, thereby depriving them of one of their chief sources of nourishment. The United States Department of Agriculture has made an exhaustive study of the insect enemies of cotton, and bulletins containing the results of their investigations may be obtained on application. The caterpillars may be killed by spraying the plants in July and August with poisons containing arsenic, or by sprinkling them with Paris green.

A Booklet on Cotton

Fold three sheets of paper into a booklet of twelve pages.

Cover page—Subject, name of pupil and school.
Illustrate with a border design of conventionalized cotton blossoms.
Inside cover—Index.
Page one—Poem, *The Cotton Plant.*
Illustrations: Illustrate each stanza with the object described—child's dress, child's reading book, newspaper, etc.
Page two—Story of cotton: varieties, where raised, planting, cultivating, harvesting.
Illustrations: Plant and blossoms, open boll, cotton field.
Page three—Cotton ginning and pressing.
Illustrations: Whitney's gin, showing working parts; modern gin; gin and press building.
Page four—History and growth of the cotton industry.
Illustrations: Hauling to market; cotton market; loading steamer.
Page five—Cotton products—fabrics, rope, batting, absorbent cotton, explosives, celluloid, artificial silk.
Illustrations: Old-fashioned spinning wheel; up-to-date spinning frame; loom.
Page six—Cottonseed products—cattle feed, oil, oil cake, meal, hulls, cottolene.
Illustrations: Oil, cottolene, meal.
Page seven—Cotton textiles—gingham, prints, percales, muslins, calicoes, denims.
Illustrations: Samples of fabrics and development of same. Make an original design for calico.
Page eight—Enemies of cotton (see article).
Illustrations: Sketch of boll weevil and plant, showing damage done.
Inside back cover—Biography of Eli Whitney.
Back cover—Blank.

Directions for fighting the boll weevil are given in the article Boll Weevil.

Other enemies of cotton are the diseases caused by certain flowerless plants known as fungi (which see). Important among these diseases is *wilt,* produced by a fungus that enters the roots of the plant through the soil, clogging its cells and causing its leaves to droop and die. No method of curing this disease is known, and it is best fought by destroying infected plants and by means of crop rotation. Extreme dry or wet weather, or poor soil, may cause the drying up or shedding of the bolls by interfering with the supply of nourishment furnished the plant through its roots.

One authority makes the statement that the cotton plant has more to fear from ignorance than from all enemies combined. The more enlightened the planter becomes in matters pertaining to the preparation of the soil and the care of the plants, the better equipped will he be to combat the enemies of the crop.

Some Cotton Figures. The Southern states of America furnish the nations of the world with the bulk of the raw cotton used by their manufacturers. The following table shows the average annual production in bales of 500 pounds each, of the states not represented in the accompanying graphic illustration:

Oklahoma	1,016,000
Arkansas	884,000
North Carolina	875,000
Louisiana	300,000
Tennessee	357,000
Missouri	71,000
Florida	18,000
Virginia	24,000
Other states	33,000

The cotton mills of the United States consume each year about 5,000,000 bales. Exportations to Europe were very seriously affected by the outbreak of the War of the Nations in 1914, but under normal conditions Great Britain imports 4,000,000 bales of American cotton a year; Germany and France are next in order, with averages of 2,800,000 and 1,150,000. Italy purchases over 560,000; Spain, about 315,000; and Belgium about 222,000. Over 400,000 bales are sent each year to Japan, and about 170,000 to Canada.

Great Britain became the leading cotton-manufacturing country of the world in the eighteenth century, and continues to hold that position. The industry is centered in Lancashire. Germany, Russia, Japan, India, France, Austria, Italy, Belgium, Spain, Canada, Netherlands and Switzerland are the countries next in order. After the outbreak of the War of the Nations Japan and Spain greatly increased their output.

The total number of spindles in the United States is over 30,000,000, and more than a third of these are in Massachusetts South Carolina ranks second, North Carolina third, and Rhode Island, Georgia, New Hampshire, Connecticut and Maine have each over 1,000,000 spindles. B.M.W.

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"KING COTTON."

At left: A cotton plant in bloom. At right, picking cotton on a Southern plantation.

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A FORTUNE IN COTTON.

A familiar scene at Southern shipping ports. Each bale weighs about five hundred pounds, and in normal times is worth fifty to sixty dollars.

OUTLINE AND QUESTIONS ON COTTON

Outline

I. Where Grown

(1) United States
(2) Egypt
(3) India
(4) Other countries
(5) Most favorable latitude and growing conditions

II. Different Kinds

(1) Sea-island
(2) Egyptian
(3) Peruvian
(4) Upland

III. The Cultivation of Cotton

(1) Planting
  (a) By means of machinery
  (b) Season
(2) Cultivating
  (a) Method
  (b) Frequency
(3) Picking
  (a) How the cotton looks
  (b) When gathered
  (c) How gathered

IV. Preparation for Market

(1) Ginning
  (a) Old-time hand process
  (b) The cotton gin
(2) Formation of a bale
  (a) Size
  (b) Weight
  (c) Value
(3) Later processes
  (a) Rolling
  (b) Stretching and twisting
  (c) Spinning
  (d) Weaving

V. By-Products

(1) Linters
(2) Seed products
  (a) Food for stock
  (b) Cottonseed oil
  (c) Cottonseed meal
(3) Stalk products
  (a) Paper pulp
  (b) Fertilizer
  (c) Lesser uses

VI. What the Cotton-Planter Must Fight

(1) Insect pests
  (a) Boll weevil
  (b) Cotton leaf worm
(2) Disease
  (a) Wilt
(3) Methods of opposing these evils

VII. Cotton Manufacture

(1) Chief countries
  (a) Great Britain
  (b) United States
  (c) Germany
  (d) Russia
  (e) Other countries

Questions

How many pounds of sea-island cotton would it take to spin a thread long enough to reach from Chicago to New York?

If you went into a cotton field, how could you tell which blossoms had just opened and which had come out the day before?

What are "squares"? What are "linters"? How are the latter used?

What little worm has the power to frighten England more than the advance of a hostile army on her Asian outposts? How is it most effectively fought?

Which is the more valuable crop in the United States, cotton or corn? Cotton or wheat?

How does the planter know when the cotton is ready to be picked?

Why should the greatest cotton-producing country in the world import any cotton?

What is meant by the statement that this plant "furnishes food for man and beast and soil"?

How can cotton plants help in the conservation of forests?

Consult *Bulletin 33,* United States Department of Agriculture, "The Cotton Plant"; Watkins' *King Cotton;* Brooks' *The Story of Cotton.*

Related Subjects. The following articles in these volumes will help to make clear the importance of cotton, as well as the methods of dealing with it in various stages:

Adulteration of Foodstuffs and Clothing	Crinoline
Boll Weevil	Dimity
Burlap	Gauze
Calico	Gingham
Cambric	Guncotton
Canvas	Lace
Cotton Gin	Muslin
Cottonseed Oil	Spinning
Cretonne	Thread
	Weaving

See, also, the articles on the countries and states in which cotton is extensively grown.

COTTON, John (1585-1652), a Puritan clergyman, plain and simple, yet of burning eloquence in the pulpit and noted as a profound scholar. He was born at Derby, England, and was educated at Trinity College, Cambridge, where he later became a tutor. About 1612, and for twenty years after, he was the vicar of a church in Boston, Lincolnshire. In 1633 he was summoned to appear before Archbishop Laud because he refused to kneel at a certain point in the Church service. Instead of answering the summons he fled to Boston, New England, where he preached till his death. He is sometimes called the *Patriarch of New England.* Cotton wrote and published a catechism, forms of prayer and other works, chief among them being a defense of the right of civil authority to interfere in religious matters. The latter appeared during his controversy with Roger Williams (which see).

COTTON GIN, *jin,* a machine invented in 1793 by Eli Whitney for separating cotton fiber from its seed. It made cotton the staple crop of the Southern United States and one of the greatest agricultural products in the world, and caused the extension of slavery, which brought on the War of Secession. Before its invention the *sea-island cotton* was the only American cotton worth exporting. The rollers which were used to separate it from its seeds would not clear the green-seeded cotton grown inland; a day was required by a workman to pick the seeds from a pound of fiber. Whitney's *gin* (a negro corruption of the word *engine*) consisted of circular saws on a cylinder, turning within a wire cage. The saws pulled the fiber into the cage, and the seeds were too large to enter. With very few changes in its original principle this form of machine is still used. It is not successful, however, with the Egyptian and sea-island cottons, as it breaks their long fiber. For these the old roller-method, though it produces only about one-fifth as much cotton, is preferred.

The immediate result of Whitney's invention was that one negro slave, turning the machine by hand, could do the work formerly performed by fifty, and the application of steam power further multiplied the individual output. In the first seven years of the gin, American cotton exports increased over thirty-fold. Cotton planters cultivated all the available land in the South, and their spread into Texas was one of the contributing causes of the Mexican War. A cotton-picking slave became worth five times as much as he was worth in 1792. To-day without gins fifteen to twenty million people would have to work every day to separate from its seed the cotton grown in the United States. See Cotton, where an illustration appears; also Whitney, Eli.

COTTONSEED OIL, a valuable oil pressed from the seeds of the cotton plant, although for many years these were considered not only worthless, but a nuisance. The oil has been found of value in the manufacture of cottolene, which is used for lard; it is also a substitute for olive oil, and is employed, too, in the manufacture of laundry and toilet soaps, and for various other purposes. The oil cake of cottonseed is a valuable feed for cattle, is used as a fertilizer, and in some food preparations. One ton of cotton seed will produce 290 pounds of crude oil. Whereas in 1850 all cottonseed in the United States was going to waste, in 1914 there were 817 mills for extracting the oil, Texas being the leading state in this industry. In that year over 157,000,000 gallons of cottonseed oil were produced, valued at nearly $148,000,000, and the fertilizers, flour-mill and grist-mill products and food preparations produced from the "cake" were valued at over $2,000,000. See Adulteration of Foodstuffs and Clothing; Cotton.

COTTONWOOD, a large, comparatively short-lived tree, loved by all who notice nature at all and especially by dwellers in cities. Early in spring its glistening buds burst open, and the tree is soon covered with broadly oval, taper-pointed, tooth-edged leaves which look cool and clean and shining through the heat and dust of summer. The busy householder sometimes objects to the catkins which fall in spring, and to the fluffy, cottony seeds which blow through doors and windows or stick to the

screens in early summer, or to the continually-falling leaves; but the shade afforded is very welcome.

A moist, strong, loamy soil is the best for this rapid grower, and cottonwood trees 100 feet high and more are found, along river banks especially, from Florida to Quebec and west to New Mexico and Colorado. They live from fifty to seventy-five years. The wood of this tree is weak, soft and dark brown in color, but is used for packing cases, barrels and boxes, woodenware and for paper pulp. The cottonwood is also known as *Carolina poplar* and *necklace poplar*. The name is due to the characteristic cottonlike appearance of the opened seed pods.

COTYLEDON, *kot i le' dun,* the name commonly given to the first leaves which sprout from a seed. If a bean be soaked, freed from its skin and then split, it is seen to be composed of two thick portions which are attached

COTYLEDONS

(*a*) Bean seedling, showing cotyledons; (*b*) lengthwise section through embryo end of a grain of wheat; (*c*) half an acorn cut lengthwise, filled with very thick cotyledons.

to each other only for a very little way. These are the cotyledons, and are not to be confused with the tiny *plumule,* or leaf folded away near the joining point. When a new bean plant pushes its way through the soil, these thick seed-leaves are clinging to it, but they gradually shrivel and drop off, without even looking like true leaves. All the plants which have their seeds enclosed in cases—*angiosperms,* to use their scientific name—are divided into two groups, according to the number of cotyledons.

Monocotyledons. These are plants which have only one seed-leaf, for *mono* means *one.* They include the palms, lilies, sedges and grasses, or grains. A kernel of corn or an onion seed cannot be split easily, as can a bean, for there is no natural line of division into two parts. When some of these plants, as the different grains, sprout, the cotyledon remains below the ground and sends up to the growing embryo the liquid food; while in others, as the onion, the cotyledon appears above the ground but never develops into a true leaf.

Dicotyledons. This word refers to plants which have two seed-leaves; they comprise most of the very numerous flowering plants. Some of the seeds are large, like those of the lima bean; some, as the portulaca, are almost as small as grains of dust, but all have the two seed-leaves. Like the monocotyledons, these plants sometimes thrust the cotyledons above the ground, sometimes leave them below, whence they send up as food the reserve material stored in them.

These two great classes comprise all the flowering plants, but the naked-seed plants, or *gymnosperms,* form a different class. The seeds of these have more than two seed-leaves, and the group is therefore called *polycotyledonous,* which means *having many cotyledons.* See Botany; Flowers.

COUCH, *kouch,* GRASS, a common grass or weed which looks somewhat like wheat. Sheep like it when it first comes above ground, and it makes good hay, but on cultivated land it is a pest. The rootstocks are far-reaching and continue to spread, often piercing roots of other plants. Deep plowing under of infested lands in summer, then rolling, grubbing, harrowing and some hand picking will effectually remove this weed. Couch grass is also known as *quick* grass, *dog* grass, *wheat* grass, etc., and also as *quack* grass, because the rootstocks are often used in patent medicines. Its medicinal qualities, however, are nearly if not quite non-existent. The matted roots of a growth of couch grass on a railway embankment are very useful in holding the loose soil together.

COUGAR, *koo' gur.* See Puma.

COUGH, *kawf.* If a particle of food or other substance becomes lodged in the throat, or if some foreign substance enters the windpipe or other air passages, we cough to expel it. Coughing is produced by an involuntary contraction of the muscles controlling the process of breathing. The cause may be irritation, due to the lodging of some substance in the air passages; or to the accumulation of matter in the air passages, resulting from a diseased condition of the lungs or throat, as in case of a cold; or to an irritated condition of the nerves controlling the action of the respiratory muscles. Dizziness in the case of adults and hardened wax in the ear in the case of children, constipation, intestinal worms, dyspepsia and liver trouble are

other causes. Coughing is a characteristic symptom of such grave diseases as tuberculosis, pleurisy, bronchitis and pneumonia.

The remedy for coughing depends upon the cause. When the cough is due to irritation of the nerves the sufferer can often control it by exercise of the will power. The victim of a cough is frequently helped by means of steam inhalation or by breathing the fumes arising from boiling water to which has been added half a teaspoonful of compound tincture of benzoin. Simple remedies for colds are hot and cold sponging of the chest and the wearing of a cold compress on the throat or chest.

COULOMB, *koo lom',* the unit quantity of electricity, it being the quantity of electricity conveyed by a current of one ampere in one second. See ELECTRICITY; AMPERE.

COUN'CIL BLUFFS, IOWA, an important manufacturing center and the county seat of Pottawattamie County, situated in the southwestern part of the state, about two and one-half miles east of the Missouri River. Omaha, Neb., across the river, is connected with Council Bluffs by railway and wagon bridges and by electric lines. Des Moines, the state capital is about 125 miles northeast. Not many cities in the United States have better railway accommodations than those afforded Council Bluffs by the Burlington Route; the Chicago & North Western; Chicago Great Western; Chicago, Milwaukee & Saint Paul; Chicago, Rock Island & Pacific; Illinois Central; Union Pacific, and Wabash railroads. Electric lines connect with Lake Manawa, a summer resort three miles distant, and with Fairmount and other parks in the vicinity. The area of the city is about eighteen square miles. The population, composed of Americans, Swedes, Danes, Germans, Greeks and Italians, increased from 29,292 in 1910 to 36,162 in 1920.

Council Bluffs is located in a rich agricultural region at the foot of high bluffs, which command a beautiful view of the city and river. On these bluffs the Indian tribes formerly held their councils. Owing to the exceptional transportation facilities, the city is an important distributing point. It has a large trade in fruit and produce and maintains eight large grain elevators. As a manufacturing center for agricultural implements, it holds high rank; other manufactures of importance are iron, carriages, fire extinguishers and machinery. There are also large cattle yards and flour mills.

The notable buildings are a $250,000 Federal building, erected in 1885, and the county courthouse. Among the benevolent institutions are the Christian Home Orphanage, Council Bluffs Sanitarium, Neal Institute, Jennie Edmundson Memorial Hospital, Mercy Hospital, Saint Bernard's Hospital and the state institution for the deaf and dumb. In addition to the public school system educational advantages are afforded by My Lady of Victory Seminary, Saint Francis Academy, two business colleges and a Carnegie Library.

On the site of Council Bluffs, in 1804, the explorers Lewis and Clark held council with the Indians, hence the name of the city. There the Mormons tarried from 1846 to 1849 on their way to Utah, their final destination; they called the settlement Kanesville. The present name was adopted in 1850, when the city was chartered. For many years Council Bluffs was the westernmost city of civilization in the United States, and California emigrants and trappers found supplies there before entering the wilderness of the Indians. H.E.C.

COUNTERFEITING, *koun'ter fit ing,* is the making, without lawful authority, imitations of money, either paper or coin, or the production of any article in imitation of another with intent to secure the use of the false rather than the genuine. As the making of money is a function of a national government and not of its states or provinces, the making of counterfeit money is a crime against the Federal government. Some nation's laws are so stringent that it is a crime even to paint on a billboard a likeness of any coin or paper money; this is true in the United States. Moving-picture exhibitions are also prohibited from displaying films showing the processes of counterfeiting. Officials are constantly at work in each of the ten secret-service districts into which the United States is divided to detect passers of counterfeit money and to punish those who engage in its manufacture. The penalty for counterfeiting or passing counterfeit money ranges from five to twenty years' imprisonment and fines from $5,000 to $10,000. Both fine and imprisonment may be imposed, in the discretion of the court.

COUN'TER-REFORMA'TION, the term used to designate the period of Roman Catholic revival, between 1560 and 1648, during which the Church undertook to reform abuses, to counteract the influence of Protestantism in countries where it was liable to be implanted, and to exterminate it where it had taken root. Previous to the Reformation there had been a demand from the faithful for reform on the

part of the clergy, from the most eminent to the humblest, but little was accomplished until the Council of Trent was called, which continued, with interruptions, from 1545 to 1563 (see TRENT, COUNCIL OF). This council clearly outlined and emphatically reaffirmed Roman Catholic doctrine, and measures were adopted to correct the prevalent objectionable abuses.

To the Jesuits, zealous, self-sacrificing teachers of Roman Catholicism, is due much of the work accomplished during this period in establishing Roman Catholic missions and in education. Other movements to check the growth of Protestantism were accompanied necessarily by violence. Bohemia was retained after the Thirty Years' War, which was the result of the attempt to repress Protestantism in Germany, and which ended with the Peace of Westphalia in 1648 (see THIRTY YEARS' WAR). In Spain and Italy, where Protestantism had only a feeble existence, the movement led to the Inquisition. In England all outward efforts to effect a return to Roman Catholicism were abandoned after untiring, heroic endeavor. See REFORMATION, THE. G.W.M.

COUNTY, *koun'ti,* a political subdivision of a state or province having legally-defined boundaries designated by the legislature, and possessing certain privileges of independent government within itself. To carry on the principle of local government the county is further subdivided into townships, and the townships into school districts, etc. The county seat is usually the chief center of business and political interest, as here are the county offices in which the records are kept and in which sessions of the county or circuit court are held at least twice a year. No division of a county may be made without the consent of the majority of the voters; neither can two counties be joined without the majority vote of all the citizens affected. Only matters which pertain directly to the residents of the county are proper subjects on which county authorities may legislate absolutely.

County officials are chosen usually for terms of two years each; these are the sheriff, clerk, treasurer, prosecuting attorney or state's attorney, register of deeds, or recorder, judge of probate, surveyor, superintendent of schools, circuit court commissioner and coroner. The sheriff and treasurer under most state constitutions are eligible only for two successive terms, and the same is sometimes true of the county superintendent of schools; the other officers may continue in office as long as they are able to secure reëlection. The amount of salary paid an officer is left to be determined by the board of supervisors or the county commissioners. A.E.R.

COURT-MARTIAL, *kohrt'mar shal,* a naval or military court convened for the purpose of trying distinctly naval and military offenses. The United States army is governed by rules and regulations derived from the British army, and the courts are similar. Commissioned officers may be tried only before *general courts-martial;* commissioned officers compose the jury. *Regimental courts-martial* deal with affairs of one particular regiment, and the jury is chosen from among the members of that regiment. *Garrison courts-martial* similarly deal with garrison affairs. A *summary court-martial* may be convened by authority of a general officer, to consist of only one officer, who tries cases arising in active service. The decision of such a court must be upheld or disapproved by the authority appointing him; there is no appeal except to the President of the United States, who is commander-in-chief of the army and navy. Naval courts are similar in principle, dealing only with offenses committed by naval men.

If the offense for which a man is tried by court-martial is also an offense against the law of the country, the offender is handed over to the civil authorities to suffer the penalty for his misdeeds. The plural form of the word is *courts-martial.*

COURT-PLASTER, thin silk treated with benzoin and varnished on one side with a glue made of isinglass and glycerine. Black, flesh-colored and white silk is used in its manufacture, and it is moistened and applied to the skin to protect slight cuts and abrasions from dirt and germs. Its name comes from an ancient custom of court ladies, who wore specks of black plaster on the face to set off the delicacy of the complexion. These were cut in various shapes—hearts, stars, half-moons, etc.

COURTS, *kohrts,* the tribunals established by a government to exercise its judicial functions. Courts exist for the interpretation and enforcement of law and for the preservation of the rights of society and of individuals. Not only do they fix penalties for violations of the law, but the highest courts interpret the laws passed by legislative bodies and determine whether or not they conform to the basic law and should be allowed to remain upon the statute books. The decision of the highest court in determining the constitutionality

of a law is final; there can be no appeal. Under the provisions of laws which are accepted as constitutional, the courts inflict punishment for offenses against society and also decide cases in which the rights or interests of individuals are in conflict. The orders of the courts are carried out by bailiffs, marshals, sheriffs and other executive officers.

United States there are two distinct systems of courts, one established by Federal authority, the other by the state.

Federal Supreme Court. The Constitution (Article I, Sec. 1) provides that "the judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish." The first Congress in 1789 decreed

UNITED STATES COURTS

Title	*Organization*	*Jurisdiction* *
Supreme Court.	A chief justice, $15,000; eight associates, $14,500.	This court has original jurisdiction in all cases relating to ambassadors and other public ministers and consuls, and in those to which a state is a party. It has appellate jurisdiction in all cases originating in the inferior courts, save such as Congress by law shall except. Appeals may be made to it, and writs of error lie to it, from the district courts, from the courts of appeals, and from the supreme courts of the District of Columbia and the territories.
Circuit Courts of Appeals.	Nine circuits, to each of which are assigned one Justice of the Supreme Court and from two to five circuit judges; thirty-two circuit judges in all; salary, $8,500.	Appeals from district and territorial courts.
Circuit Courts. (Abolished in 1911.)	Nine circuits, corresponding to present circuits for courts of appeals.	Extensive control of criminal and civil cases practically identical with that of present district courts.
District Courts.	One hundred and three, districts including Alaska, Hawaii and Porto Rico, each with a district judge; salary, $7,500.	Criminal prosecutions for violation of Federal laws, and cases connected with revenue and postal laws, bankruptcy and admiralty matters. In a general way district courts have jurisdiction in all cases assigned by the Constitution (Article III) to the Federal judiciary, except those cases in which original jurisdiction is imposed on the Supreme Court.
Court of Claims.	A chief justice, $8,000, and four associates, $7,500.	Over money claims of individuals against the government.
Court of Private Land Claims.	A chief justice, $5,000, and four associates, $5,000.	Decides conflicting claims of title to certain public lands.
Court of Appeals District of Columbia.	A chief justice, $6,500, and two associates, $6,000.	Hears appeals from the supreme court of the District of Columbia.
Supreme Ct. District of Columbia.	A chief justice, $5,000, and four associates, $5,000.	Resembles in jurisdiction other United States district courts.
Territorial Courts.	Judges appointed for four years.	Resembles United States district courts.
Admiralty.	Courts, Commissioners' Courts, and Courts-martial.	

* The supreme court has both original and appellate jurisdiction; the circuit courts of appeals, and the court of appeals for the District of Columbia, have only appellate jurisdiction; the other courts only original jurisdiction.

Original and Appellate Jurisdiction. The term *original jurisdiction* refers to the legal power of a court to conduct the first trial of a case at law. In this it differs from a purely *appellate court*, which may hear only cases which have been tried first in a lower tribunal and appealed to it for a change in the verdict rendered. Some courts have both original and appellate jurisdiction; they may hear cases appealed from a lower court and may also decide new issues.

United States Judicial System. In the

that the Supreme Court should be composed of a Chief Justice and five Associate Justices. At the same time the United States was divided geographically into six judicial circuits, for the better handling of court business, and a Justice of the Supreme Court was assigned to each circuit. In 1869 the number of Justices and circuits was increased to nine. Justices of the Supreme Court, like all Federal judges except in the territories, are appointed for life or during good behavior.

Lower Courts. By the same act of 1789, already referred to, the United States was divided into thirteen judicial districts, since increased to 103. In each district there is a district judge, appointed by the President. At first there were

no special circuit judges, court being held by the Supreme Court Justice assigned to a circuit, but later special circuit judges were appointed to relieve the members of the Supreme Court of some of their increasing burdens. In part the circuit judges and district judges had concurrent jurisdiction—that is, either court might try certain cases. This duplication was eliminated in 1911, when the character of the circuit courts was changed. Their original jurisdiction is now vested in the district courts, and the circuit courts are now only courts of appeal. The functions and organization of these courts, as well as of certain special courts, is indicated in the preceding table.

State Judicial Systems. The judicial machinery of a state is based on the Federal system, with only slight differences in practice, but confined in its operations strictly to the territorial limits of the state. The highest judicial tribunal is usually the supreme court, though a few states have a higher appellate court or an appellate branch of the supreme court. Each county has its county court, or circuit court; a state judicial circuit may comprise a single county or a number of counties; one circuit judge presides over an entire circuit. The county or circuit court has appellate jurisdiction over cases arising in the justice courts, and original jurisdiction in all civil and criminal cases arising under state laws.

Below the county courts are the judicial tribunals of the township, the justice courts presided over by a justice of the peace, and the municipal courts in cities. Jurisdiction of these lowest courts is usually limited to civil cases where only small amounts are involved, but in some states it includes examinations of persons accused of crime to determine whether the accused shall be held for trial to the county court. In such cases this justice court procedure takes the place of what in other states falls to the duty of the grand jury. In a few states the justice of the peace may bind accused persons over to the grand jury. For details of the judicial system see subtitle *Government,* under each state.

Canadian Courts. In Canada, as in the United States, there are two classes of courts—Federal and local (provincial). The Federal courts are the Supreme Court of the Dominion, which sits at Ottawa, and the Exchequer Court; the members of both are appointed by the Governor-General in Council. The Dominion government also appoints and pays the salaries of all provincial judges except the local police magistrates and justices of the peace, who are appointed by the lieutenant-governor in council in each province. The provincial government, moreover, determines the organization and procedure of provincial courts. The jurisdiction of the latter—including the provincial supreme courts, the county courts, etc.—is similar to that of the corresponding courts in the United States. For further details, see CANADA, subtitle *Government;* also subhead *Government* under each province.

Courts in Great Britain. In Great Britain the functions of a highest court are divided between two bodies, the House of Lords and the judicial committee of the Privy Council. The House of Lords is the supreme appellate court of the kingdom, except for cases arising in the colonies; these are carried not to the Lords but to the Privy Council (see GREAT BRITAIN, subtitle *Government,* subhead, *The Judiciary*). Below the House of Lords is the Court of Appeals, which hears appeals from the three branches of His Majesty's High Court of Justice. These branches are the Chancery Division (six judges), the King's Bench Division (fifteen judges) and the Probate, Divorce and Admiralty Division (two judges). The King's Bench has jurisdiction over criminal cases and some civil suits, including those affecting the Crown; the jurisdiction of the other divisions is indicated by their names. The Court of Appeals is composed of the Lord High Chancellor, any men who have held that office, the Lord Chief Justice and seven other judges. The inferior or local courts in Great Britain may be grouped in four classes: (1) those having criminal or quasi-criminal jurisdiction, including the (2) borough sessions, petty or special sessions, and general session; local civil courts of record, such as the borough and county courts; (3) the university courts of Oxford and Cambridge, with limited jurisdiction when members of the university are involved; and (4) manorial courts, of which a few still survive. W.F.Z.

Consult Foster's *Treatise on Federal Practice;* Curtis's *Jurisdiction of United States Courts.*

Related Subjects. The reader is referred to the following articles in these volumes:

Constitution of the United States
Justice of the Peace
Parliament, subhead *House of Lords*
Supreme Court

COURTSHIP OF MILES STANDISH, one of the best-loved narrative poems of Henry Wadsworth Longfellow, a simple epic of Puritan life in the colony of Plymouth. Since its publication in 1858 it has been a universal favorite, because no poem is more distinctively American in spirit, or pictures more vividly

the life of the Pilgrim Fathers in the first New England colony. Three persons stand out prominently in the tale—Captain Miles Standish, a valiant warrior, John Alden, his trusted friend and sharer of his home, and Priscilla Mullins, "the Mayflower of Plymouth." During the first hard winter in the new colony, Rose Standish, wife of Miles, died, and in his

JOHN ALDEN'S COURTSHIP
Drawn from the statuette designed by John Rogers.

loneliness the bereaved Captain thought longingly of the beautiful Priscilla. She likewise was grieving for loved ones, for among the pathetic group of mounds in the little Plymouth cemetery were the graves of her father, mother and brother.

The Captain, though fearless in battle, was weak of heart when it came to a matter of wooing. Said he to his friend John—

I can march up to a fortress and summon the place to surrender,
But march up to a woman with such a proposal, I dare not.
I'm not afraid of bullets, nor shot from the mouth of a cannon,
But of a thundering 'No!' point-blank from the mouth of a woman,
That I confess I'm afraid of, nor am I ashamed to confess it.

So he persuaded young Alden, the handsomest man in the colony, to go to the damsel Priscilla and tell her that "a blunt old Captain offered her the hand and heart of a soldier." It happened that Alden himself loved Priscilla, and it was with a sorrowful heart that he opened the door of her home and beheld her—

Seated beside her wheel, and the carded wool like a snowdrift
Piled at her knee, her white hands feeding the ravenous spindle.

Eloquently and bravely he pleaded the cause of his friend, but Priscilla, knowing what was in his heart—

* * smiled, and, with eyes overrunning with laughter,
Said, in a tremulous voice, "Why don't you speak for yourself, John?"

The story of the Captain's courtship is based on a well-founded tradition, and a prose version of the tale was published by one of the descendants of John Alden in 1812-1814. This narrative states briefly that John soon visited Priscilla again on his own behalf, and that in due time they were happily married. As for the Captain, it is said that "he never forgave his friend to the day of his death." Longfellow, however, has given the story an added touch of romance, for we read in his poem that the Captain was called away to fight the Indians, but that he returned on the wedding day in time to renew the old ties of friendship and to wish the bride "joy of her wedding."
See ALDEN, JOHN; STANDISH, MILES. B.M.W.

COVENANTERS, *kuv'e nan turz,* a name applied to a group of people in Scotland, the members of which bound themselves by a series of *covenants* to uphold the Presbyterian forms and doctrines of faith. The most important of the early covenants was drawn up in 1581, at a time when a serious effort was being made to regain Scotland for the Roman Catholic Church. The *National Covenant* of 1638, which was a revival of the covenant of 1581, was adopted and signed at Edinburgh as a result of the efforts of Charles I and Archbishop Laud to force English forms of worship on the Scottish people. The *Solemn League and Covenant,* entered into by the General Assembly of the Church of Scotland and commissioners of the English Parliament in 1643, was practically a treaty between England and Scotland providing for the establishment of the Presbyterian Church in England, Scotland and Ireland. Both of these covenants were repudiated by Charles II after he was restored to the throne.

COVENTRY, *kuv'en tri,* an important manufacturing city in Warwickshire, England, eighty-five miles northwest of London. It is famous in history as the city through which Lady Godiva is said to have ridden naked to save the people from taxation. The town is of great antiquity; as early as 1043 its founder, Earl Leofric, established there a Benedictine monastery, which afterwards became famous as the scene of many religious pageants. It contains many ancient houses, and traces of the old wall surrounding the town are still visible. It has far outgrown its original boundaries, but its appearance suffers considerably from the fact that the new portion is not laid out with any regularity.

All public utilities are municipally owned. Coventry is the center of British automobile and cycle industries and has extensive manufactures of ribbons, watches, sewing machines and guns. For the story of Lady Godiva, associated with Coventy, see Godiva, Lady. Population in 1921, 128,205.

COVERDALE, *kuv'er dale,* Miles (1488-1568), bishop of Exeter, England, famed as the man who in 1535 brought out the first translation of the Bible printed in the English language. He was born in Yorkshire, was educated at Cambridge and became an Augustinian monk in 1514. In 1526 his religious opinions had so far changed that he left the convent and devoted himself to the work of the Reformation. The Bible of Cromwell, or the *Great Bible,* was printed under his direction. He was married in 1540 and in 1551 was appointed to the see of Exeter, and there remained until the accession of the Catholic Mary, in 1553, when he was ejected and imprisoned. Through the intercession of his chaplain, who was his brother-in-law, he was released and went to Denmark. After Elizabeth became queen in 1559 he returned to England and was appointed bishop of Llandaff, but resigned. The Archbishop of Canterbury then gave him the post at Saint Magnus in London, where he remained until his death.

COVINGTON, Ky., one of the county seats of Kenton County, is the second largest city in the state. The population in 1910 was 53,270; in 1920 it was 57,121. It is on the Ohio River, opposite Cincinnati, and at the mouth of the Licking River. Across the Licking is Newport, Ky. A fine suspension bridge between Covington and Cincinnati is 2,250 feet long and cost $2,000,000. Covington is served by the Chesapeake & Ohio and the Louisville & Nashville railroads, by interurban electric lines and by steamers to other Ohio River ports.

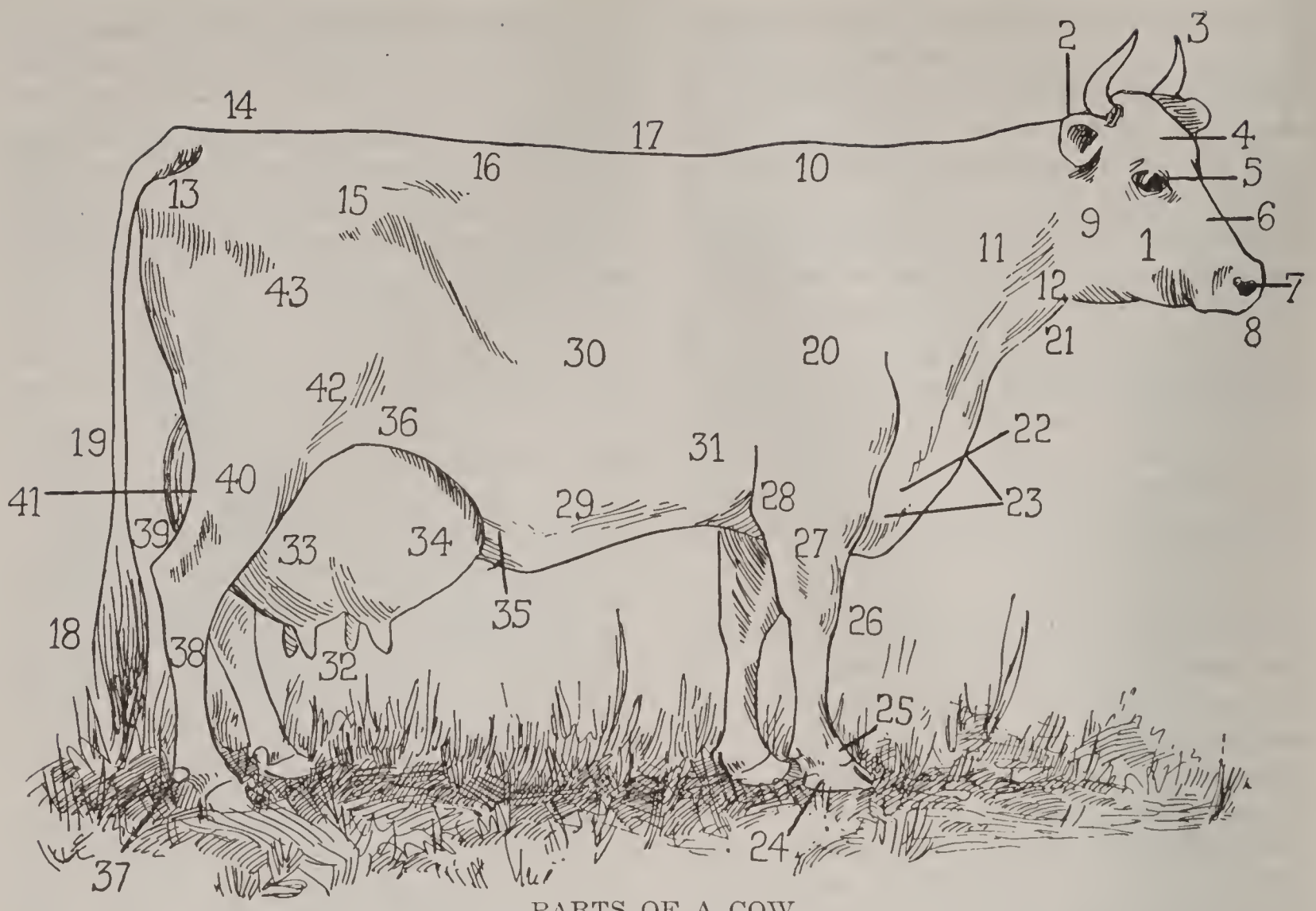
Covington is largely a residential town, the home of many Cincinnati merchants. It occupies an area of five square miles, on a plain partially surrounded by hills. Devon and Goebel parks have a combined area of 600 acres. The city has a Federal building built in modern Gothic architecture, a courthouse and city hall combined, and a public library. It is the see of a Roman Catholic bishop, and among the important Roman Catholic institutions are the Cathedral, built in flamboyant Gothic and one of the finest buildings of its kind in the state; Notre Dame Academy; La Sallette Academy; a Benedictine priory, and a convent. The city has Saint Elizabeth's Hospital, an institution for contagious diseases, a home for aged and indigent women and Roman Catholic and Protestant orphan asylums.

Its important industrial plants include large pork-packing establishments, cotton and tobacco factories, distilleries and breweries, iron and glass works, and manufactories of steam engines, furniture, clay products, automobile trucks, X-ray machines, pianos, tents, cordage and vinegar. The town was settled in 1812, was organized in 1815, and became a city in 1834. The commission form of government has been adopted.

COW, the adult female of cattle, of the genus *bos.* The word is also used to distinguish the female of some other animals; the female moose, for example, is called the cow moose, whereas the male is the bull moose. In ordinary use, however, the word *cow,* when alone, means the familiar domesticated animal, which is more valuable to man than any other quadruped, with the possible exception of the horse. In an English periodical, *Household Words,* then edited by Charles Dickens, appeared the following tribute to the cow, said to have been written by the editor:

"If civilized people were ever to lapse into the worship of animals, the Cow would certainly be their chief goddess. What a fountain of blessings is the Cow! She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe-horns, hair-combs and upper leather. A gentle, amiable, ever-yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children that we may rob her of her milk, and we only care for her when the robbing may be perpetrated."

For the story of the cow, the reader is referred to the article Cattle. The principal



PARTS OF A COW

1. Head
2. Ear
3. Horn
4. Forehead
5. Eye
6. Face
7. Nostril
8. Muzzle
9. Cheek
10. Withers
11. Neck
12. Throat
13. Rump
14. Pelvic arch
15. Hip bone
16. Loins
17. Back
18. Switch
19. Tail
20. Shoulder
21. Dewlap
22. Brisket
23. Chest
24. Hoof
25. Ankle
26. Knee
27. Forearm
28. Elbow
29. Belly
30. Side, or barrel
31. Heart girth
32. Teats
33. Hind udder
34. Fore udder
35. Milk vein
36. Flank
37. Dew claw
38. Shank
39. Hock
40. Leg, or gaskin
41. Twist
42. Stifle
43. Upper thigh

products which man obtains from the living cow are Butter, Cheese and Milk, and the industry of which these products are the result is called Dairying. The Creamery is a comparatively modern feature in the production of butter. From slaughtered cattle the principal products are Beef and Leather. All the topics mentioned are presented in their alphabetical order in these volumes.

COWBIRD, or **COW BUNTING**, a North American bird which will not rear its own young. Cowbirds are seen usually in small flocks in the fields with cattle, hence the name. The male birds, usually more numerous than females, are about eight inches long, with shining black feathers and brown heads. The females are smaller and are dull brown. These birds feed largely on insects and worms, sometimes on seeds and berries.

The unnatural habit of the European cuckoo of depositing its eggs in the nests of other birds, thereby shifting its domestic responsibilities, is also a habit of the cowbird. Although a single bird lays several eggs, it never deposits more than one in the same nest. The nests of various species of small birds are chosen, and the difference in the eggs is usually not noticed by the honest and happy owners. The young cowbird, when hatched, is larger than the true nestlings and is more greedy, hence it gets most of the food. Sometimes, however, if the intruding egg is recognized, particularly in the nest of a yellow warbler, the nest is sealed over and abandoned, and another nest is built on top of the old one. The habit of making no nest has earned for the cowbird the name *lazy bird*. Its call is a grating whistle, followed by a few sharp notes. See Cuckoo.

COW PARS'NIP, a large, coarse, hog-fattening plant of the parsley family. It grows to a height of from three to six feet and bears handsome, hairy leaves and large clusters of small, white flowers. Though rather striking in appearance, the cow parsnip becomes a troublesome weed if allowed to grow in damp

soil near the water. In some places it is used in place of celery; in others, merely as fodder. In some parts of Siberia the stalks are fermented and distilled into liquor.

COWPER, *kou'per,* or *koo'per,* WILLIAM (1731-1800), an English poet whose verse pointed the way toward a new epoch in English literature. Love for humanity and nature, warmth of feeling and imaginative glow are revealed in his work and show him to have been a pioneer in the movement which reached its height in the poetry of Burns, Wordsworth and the other Romantic poets (see ROMANTICISM). Having finished his studies at Westminster School, Cowper became a clerk in the office of a London solicitor, and in 1754 was admitted to the bar. He was of a nervous temperament and easily depressed, and about this time he began to suffer from attacks of melancholy that returned at intervals all the rest of his life. A clerkship in the House of Lords was procured for him, but the thoughts of the preliminary examination so unnerved him that he became insane and tried to commit suicide. Upon his recovery he was taken to Huntingdon, where he formed a memorable friendship with the family of Morley Unwin, a clergyman.

WILLIAM COWPER

In 1767, shortly after Mr. Unwin's death, Cowper accompanied Mrs. Unwin and her children to Olney, where he remained for nineteen years. In this village he turned seriously to literary work, making his appearance as a writer in 1779 with the publication of the *Olney Hymns.* Among these hymns is the one containing the beautiful lines:

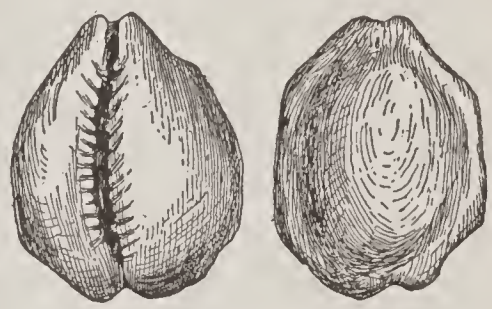
Oh! for a closer walk with God;
A calm and heavenly frame;
A light to shine upon the road
That leads me to the Lamb!

Two other favorite songs belong to this group, *There Is a Fountain Filled with Blood* and *God Moves in a Mysterious Way.*

In 1782 he issued a volume of verse containing *Table Talk, Truth, Expostulation* and other well-known poems, but it was the publication of *The Task,* three years later, that established his fame. This is a long poem written in blank verse that is suggestive of Wordsworth in its descriptions of natural beauty. With it appeared what is perhaps his best-known poem, *The Diverting History of John Gilpin.* A translation of Homer, begun in 1784, two years before his removal to the neighboring village of Weston Underwood, was published in 1791. Three years later he suffered from an attack of insanity that marked the end of his creative work.

Though Cowper does not rank with the most distinguished poets of his country, he has an important place in its literature, and many of his lines, such as "I am monarch of all I survey," from *Alexander Selkirk,* and "O, for a lodge in some vast wilderness," from *The Task,* are familiar quotations. B.M.W.

COWRIE, or **COWRY,** *kou'ri,* the name of a genus of mollusks comprising nearly 200 species, with oval highly-polished shells of beautiful color. The fact that gives the cowrie chief importance is that the shells are used in many uncivilized parts of the world as money. Cowries live in the warmer oceans under rocks and coral reefs and feed on polyps or sea anemones. The outer lip of the shell is thickened and reflected so that the aperture becomes long and narrow. Among uncivilized tribes cowries are used for personal adornment, and bands of cowrie shells are used to trim the harness of elephants and horses in India. Dainty little charms such as beads, bracelets and brooches are also made from the small blue-black money cowrie.



A COWRIE
Viewed from both sides.

The small shells used as money need only to be strung to be used as currency, the value differing in the region where they are used as the medium of exchange. On the west coast of Africa the value of 100 shells is one English penny, and 6,000 cowries are of the value of one dollar. See MOLLUSKS.

COWSLIP, *kou'slip,* the "poet's flower of spring." There are four distinct flowers of different forms and colors which are called by the name. In the United States and Southern Canada "the *marsh marigold* shines like fire in fields and copses gray." It is a large, yellow-flowered plant of the buttercup family, and it is frequently called cowslip. It grows

in swampy places, and in early spring its leaves and stems are often gathered for greens.

The beautiful plant of the primrose family, with its nodding, startled - looking flowers of magenta, pink or white, known in the Western states as the shooting star, is called the American cowslip. The petals of this pointed little flower bend backward, away from the shooting, golden anthers. The *Virginia cowslip* belongs to the borage family, and is known as the *bluebell,* or lungwort.

VIRGINIA COWSLIP

And ye talk together still,
In the language wherewith Spring
Letters cowslips on the hill.
—TENNYSON: *Adeline.*

In England the name is given to the *pale primrose,* a pretty little herb found in pastures and meadows. It has a cluster of buff-yellow, scented flowers, in the midst of a rosette of spreading leaves.

COX, JAMES M. (1870-), three times governor of Ohio and in 1920 the nominee of the Democratic party for President of the United States. He was born at Jacksonville, Ohio, March 31, 1870, was reared on a farm and received a high school education. Early in life he became a printer, ultimately becoming owner of the Dayton *News* and the Springfield *Press-Republic.* He was a Representative in Congress from the Third Ohio district for two terms ending in 1913, in which year he was first elected governor. He served one term, then was in private life over one term, when he was again elected to the same office. Governor Cox has been twice married, and has a fine estate near Dayton, his home city. His Republican opponent for the Presidency, Senator Harding, was also an Ohioan and an editor.

COYOTE, *ki'ote* or *ki ot'e* (Spanish, *ko yo' tay*), the slinking, evil-eyed, fleet-footed American prairie wolf so often mentioned in American Indian folklore. Several species live in ground-holes or among rocks almost everywhere from the Great Plains to the Pacific Ocean. When they feed on gophers, mice, etc., they are helpful, but in the winter when such ground animals are not to be found, the coyote's snapping yelps heard at night mean death for the ranchman's live stock and poultry. Though they seldom attack human be-

THE COYOTE

ings, they formerly proved so troublesome in some of the Western states that rewards were offered for their capture. Coyotes are very cunning, however, and skilfully avoid traps. They are about the size of setter dogs, and have bushy tails. Their fur is soft, light-yellowish or yellowish-gray, sometimes tipped with black, and is used for great coats, lap robes and driving gloves, the best skins for these purposes selling for fifty cents or seventy-five cents each.

CRAB, *krab,* a name given about a thousand species of small shellfish, many of which are highly valued, but more as a delicacy than as a nutritious food. Most species of crab are found in seas, especially near the coast, and

FRESH-WATER CRAB

being carrion eaters, they keep the shore clean; but some are found in fresh water in the warmer parts of the world. A species called the *land-crab* burrows in sand or lives in moist vegetation. Some crabs are very tiny, like the pea-crab, which can make its home with an oyster in its shell. Others are very large, like

the *giant crab* of Japan, which measures as much as eighteen feet from tip to tip of the first pair of limbs, or the great *stone crab* of Tasmania, which often reaches a weight of thirty pounds. The color of crabs varies from black to white through all the colors, although green, blue and gray ones are most common.

Though related to lobsters, crabs have much shorter and broader bodies, and the tail, too, is very short and folds under the thorax. The head and breast are united, and the whole body is covered with a strong shell. The young throw off this covering at different times as they grow; when they are full-grown this process occurs every three or four years. Crabs which have just shed their shells are regarded as best for the market, and are known as *soft-shelled crabs*.

The crab's mouth has several pairs of strong jaws, and the stomach has a number of hard projections for grinding food. The soft, rich, yellow substance called *fat* is the liver. Its eyes are compound and are usually placed upon stalks sometimes over an inch long. Some crabs have no eyes, however, while others have two pairs. The first of the five pairs of limbs is not used for movement, but is furnished with strong claws or pincers, which are used for defense and for feeling, and the right claw is generally a little larger than the left. Crabs are very active, and have a peculiar habit of running sidewise instead of straight ahead.

The *blue crab* is most esteemed for food in the United States and Canada, and hundreds of thousands are taken, particularly from Chesapeake Bay, each year by nets and wicker traps. They are, however, very destructive to the oyster beds there, for they crush the shells of the young and eat the flesh. Fishing for edible crabs constitutes an important industry on many coasts. See CRAWFISH; HERMIT CRAB; HORSESHOE CRAB. M.S.

CRAB APPLE, a useful and ornamental tree found both wild and cultivated in temperate zones. The name was perhaps suggested by the astringency of the hard, sour fruit it bears. Although now often incorrectly applied to any long-stemmed, small, sour apple not adapted for dessert use, the name belongs strictly to the wild variety. The cultivated crab is thought to be a cross between the Siberian crab of Asia and the common apple of Europe, and is seen in all shades of yellow and red. Some varieties, like the Whitney, grown in Illinois, are excellent when eaten raw. But it is for jellies and preserves that this hard little apple is most esteemed; put to such use its flavor is unexcelled; and, too, some of the best cider is made from crabs. The Bitter Root Valley in Montana is celebrated for its fine quality of crab apples.

The Wild Crab Apple Tree. When you see a low, bushy tree about twenty to thirty feet high, with reddish-brown scaly bark, and angular, thorny twigs covered with oval, sharply-toothed, blunt-pointed leaves about three or

WILD CRAB APPLE
Leaves, flowers and fruit.

four inches long and velvety beneath, you will know it is a wild crab apple tree. If the time be May or June the spicy fragrance of perfect white, pink or deep-rose blossoms will tell you that this is the tree which in fall will bear fragrant, hard, sour little yellow fruits called crab apples. And, in winter, the farmer owning that tree may have a shelf of jars of rose-amber jelly and delicious crab-apple preserves. The wood of the tree is soft and reddish-brown, but useful for levers, tool handles, and such articles.

American crab apple trees grow from Ontario west to Michigan and as far south as South Carolina. Narrow-leaved crabs, with dark, shining, almost evergreen, leaves grow from New Jersey to Illinois and Kansas, and south to Florida and Louisiana. The fruit of the white-flowered Oregon crab, growing from Northern California into Alaska, is scarcely worth gathering. Most of New England's mistletoe grows attached to wild crab apple trees. M.S.

CRACOW or **KRACOW,** *kra'ko* (Polish), or *krah'kou* (German), an historic city, once capital of Poland, until 1919 the capital of the Austrian province of Galicia. It was the ancient center of Polish culture, where Poland's kings were crowned, and its cathedral contains the remains of John III Sobieski, Kosciusko, Poniatowski, Mickiewicz and other Polish heroes. It is separated from Russia by the

River Vistula, and its position gives it great importance as a commercial center and as a military point of strategic value. It carries on a large trade both by land and water, lumber, grain, cattle and salt being exported in great quantities. Within a few miles of the city are some of the largest salt mines in the world. Leather, machinery and chemicals are manufactured, and there is a growing production of textile fabrics.

Cracow fell to the lot of Austria at the third division of Poland. It was occupied by the French during the height of Napoleonic power, and later by the Russians. In 1815 it became a free and independent city, under the protection of Prussia and Austria. An insurrection in 1846 afforded a pretext for its annexation to Austria, under whose rule it has since remained. In 1914, during the War of the Nations, Cracow nearly fell into Russian hands. Galicia was divided by the peace conference of 1919, a part being given to the Ukraine, and Cracow was returned to its historic place in Poland. Population, 1921, 176,463. See POLAND; GALICIA; WORLD WAR.

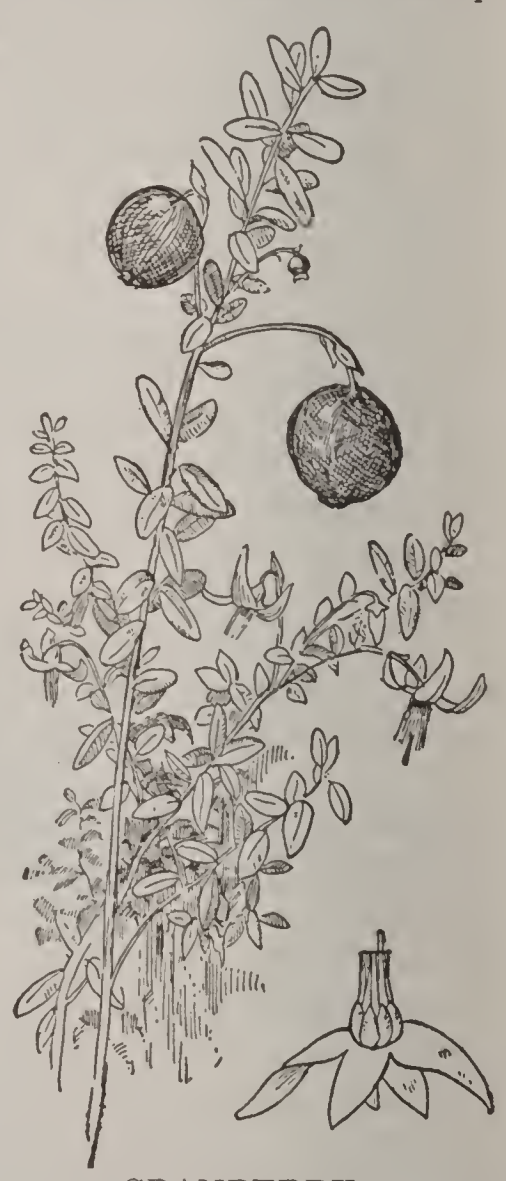
CRADDOCK, *krad'ok,* CHARLES EGBERT. See MURFREE, MARY NOAILLES.

CRAIG, *krayg,* SIR JAMES HENRY (1748-1812), a British soldier, governor of Lower Canada from 1807 to 1811. He won distinction on many fields; he was wounded at Bunker Hill, was taken prisoner at Fort Ticonderoga in 1777, served in Nova Scotia for several years and was captured with Cornwallis at Yorktown in 1781. Later, in South Africa, in India, and in Italy during the Napoleonic campaigns, he held important commands. As governor of Lower Canada, now Quebec, he was less successful, for his opinions were fixed in accordance with the views of the British official class, who were disposed to ignore the French Canadians or to suspect them of disloyalty. Craig even went so far as to arrest several French-Canadian legislators who were contributors to a newspaper which opposed his policies.

CRAIGIE, *kra'ge,* PEARL RICHARDS (1867-1906), an English writer of brilliant, cynically-witty novels and plays, better known by her pen name JOHN OLIVER HOBBES. She was born in Boston, but was taken to England in her youth and educated there. In 1887 she married Reginald W. Craigie, but secured a divorce eight years later. Her most successful plays are *The Ambassador, A Repentance,* and one written for Ellen Terry, *Journeys End in Lovers' Meeting.* Among her writings are *The Gods, Some Mortals and Lord Wickenham, Love and the Soul Hunters, The Vineyard, Flute of Pan* and *The Dream and the Business.* The latter was published after her death.

CRAIK, *krayk,* DINAH MARIA MULOCK (1826-1887), an English novelist and poet, best known as MISS MULOCK, the author of that cheerful yet touching story *John Halifax, Gentleman,* a picture of middle-class life in England. This has been translated into many languages. The poems *Douglas,* which has been set to music, and *Philip, My King,* have also been popular, and her *The Little Lame Prince* and *The Adventures of a Brownie* hold a prominent place in libraries for children. *The Ogilvies, Olive, A Life for a Life* and *Mistress and Maid* are among her less widely-known novels.

CRANBERRY, a little, red, acid fruit, without which, in the form of sauce or jelly, Thanksgiving dinner would be incomplete. The cranberry plant is a trailing vine of the heath family, which thrives in marsh or swamp lands. The leaves are small, round and evergreen; the flowers are insignificant. In autumn the bell-shaped or cherry-like fruits appear on small stems, slender and curved like the neck of a crane; hence the name *crane-berry,* or *cranberry.*



CRANBERRY
Branch, flower and fruit.

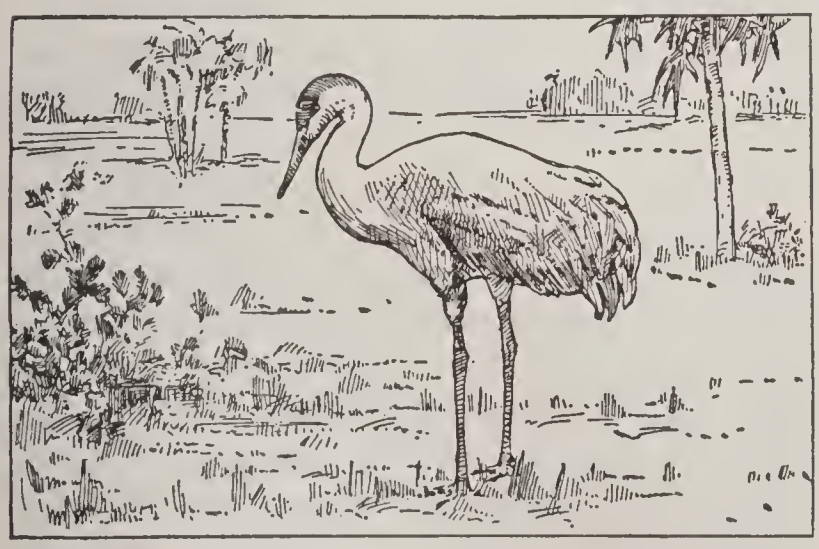
There are two species of cranberry, one bearing small fruit, the other a larger. Both kinds are found wild in America and Europe, but the large cranberry is more widely cultivated in the United States than in Europe. Over a million bushels are marketed each year in the United States; New Jersey, Cape Cod peninsula and Wisconsin produce most of this supply. Fifty bushels an acre is considered a fair yield, although more

is often obtained. Growers command from $4.50 to $6.00 a barrel for their crop.

On low, wet ground, drained so the water will be at least a foot below the surface in summer, and so level it can be flooded in dry weather, in winter, or when insects are too numerous, cranberries will produce a full crop the third or fourth year, with little cultivation. The low bush cranberry, a mountain berry sometimes called *wolf berry* or *cowberry,* is also called cranberry. It is edible and often marketed, but rarely cultivated. The high-bush cranberry is tart and seldom eaten.

CRANBROOK, a town in the southeastern part of British Columbia, the geographical and distributing center of the Kootenay Valley. Within a radius of ten miles are about a dozen large saw and planing mills, and the entire district is known for its output of gold, silver, lead and copper. Fruit raising is a favorite occupation, but there is also much mixed farming. The town supplies these varied industries and takes their products for shipment over the Crow's Nest branch of the Canadian Pacific Railway. Cranbrook is a divisional point on the railway. It is 165 miles by rail west of Macleod, Alta., and thirty-five miles directly west of Fernie. The town is the center of a provincial judicial district and has a splendid courthouse. Population in 1911, 3,090; in 1921, 2,725.

CRANE, a long-legged, long-necked bird, largest of wading birds, closely related to the rails and resembling the herons. There are three species in the United States, but they are now rare; those shown in the zoölogical gardens



THE FAMILIAR SANDHILL CRANE

are of the most common species. The *whooping crane* of the Mississippi Valley is the largest of American cranes, standing about four or five feet high; it reaches the Arctic Circle in its northern migration. It is white, with black wings. Its peculiar cry, which gives it its name, is produced by a curious windpipe, sometimes eight feet long, coiled into the crevices of the breast bone. The smaller gray-brown *sandhill crane* is known for its dance at mating time, which is often likened to an Indian war dance; it nests in the Mississippi Valley, but reaches as far north as Manitoba. The little *brown crane* is also sometimes seen on the interior plains of North America, reaching the Arctic Circle in midsummer.

The *European crane,* perhaps the best known, is about four feet high, ashy gray, with a blackish face and throat. The head is usually naked, sometimes tufted. The long, stiltlike legs are bare. The bill, longer than the head, is straight and compressed. The tail is short, and the wings are short and powerful. The feet are unwebbed and the hind toe is raised.

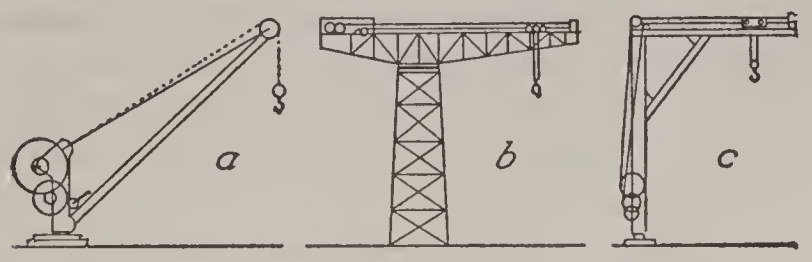
The cranes live chiefly in marshy lands, spending their summers in north temperate regions, but making long migrations to the south in winter. They feed chiefly in the early part of the day on vegetable matter, insects, frogs, worms, reptiles, small fish and eggs of water animals. The rest of the time they stand on one leg, dozing, with head drawn back on the shoulders. One of them, however, always stands on guard to warn its mates of approaching danger. They nest among bushes or in the marshes and lay but two eggs.

The *demoiselle crane* of Central Asia is noted for its graceful performances, and many other species, some with beautiful crests of long slender feathers, are noted for their peculiar dances and antics during time of courtship. Many species are easily domesticated and are regarded as sacred in parts of Japan and India. Cranes are intelligent birds and quick to note coming changes in atmosphere. The early Romans watched their flights carefully, taking them as signs of coming events. Many myths and much classical folklore have been woven about the crane. M.S.

CRANE, a mechanical device for moving and lifting weights. The name is derived from the supposed resemblance of the arm, or boom, of the machine to the neck of the bird of the same name. The lifting power may be supplied by hand, electricity, steam, compressed air or water power. The object to be lifted is connected by hooks to a chain, rope or cable, that is wound round a cylinder or a drum, which is made to revolve. The cable may pass directly from the weight to the drum, or it may be carried over a pulley at the end of a long arm, as on board ship, where it is used to lift

goods from the dock and lower them to the hold, or the reverse.

In work where great weights are being constantly lifted and conveyed from place to place, the crane is usually operated by two

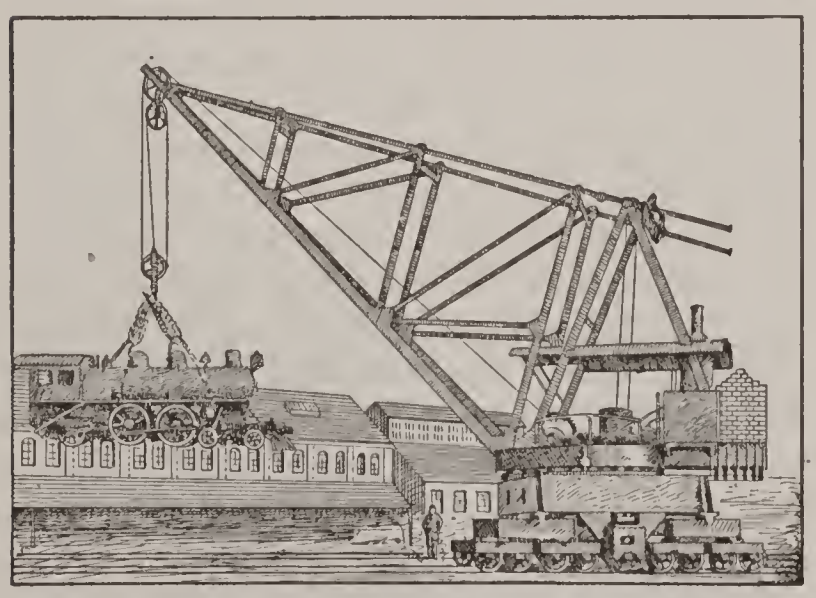


THREE VARIETIES OF CRANES

(*a*) Fixed hand-revolving jib crane; (*b*) hammer-headed crane; (*c*) foundry crane (revolving).

motors, one supplying the lifting power, the second moving the crane, with its suspended weight, along specially-laid rails to the desired point. The largest crane in the United States Navy Yard at Washington has a lifting capacity of 150 tons; there are, however, many cranes now in use with a far greater capacity. In railway works a locomotive engine may be conveyed bodily to a distant part of the plant by a powerful crane, and lowered to the ground as gently as if it weighed but a few pounds.

At various ports on the Great Lakes powerful cranes may be seen in operation as the cargoes of grain, coal and ore are taken from the holds of huge freight boats. These are equipped with self-loading and self-emptying



FORTY-TON LOCOMOTIVE CRANE

buckets, some of which hold several tons each. The largest-size cranes will unload 2,000 tons of ore an hour. F.ST.A.

CRANE, Stephen (1870-1900), an American novelist and war correspondent, "whose sun went down while it was yet day." After studying at Lafayette College and Syracuse University, he engaged in newspaper work. While thus employed, and when but twenty-one years old, he wrote and published at his own expense a realistic novel of street and slum life, *Maggie, a Girl of the Streets.* Five years later *The Red Badge of Courage* proved his wonderful powers of description. This story of a raw recruit in battle, his fear on confronting the foe and hearing the whistle of shot and shell are so vividly described, and battle scenes and tactics are so perfectly pictured that critics could not believe the story had been written by any but a war veteran.

He was correspondent for the New York *Journal* in the Greco-Turkish War in 1897, and the next year in Cuba during the Spanish-American War. All the while he was also writing novels, producing fourteen in eight years, besides many magazine stories. Through overwork his life was cut short when his brilliant powers were just developing. Among his other books are *The Little Regiment, On Active Service* and *Whilomville Stories.* Some of his manuscripts were gathered by his wife and issued under the titles *Wounds in the Rain* and *Great Battles of the World.*

CRANE, Walter (1845-1915), an English painter, book-illustrator, designer, art critic, poet, lecturer and socialist. He was the intimate friend and co-worker of William Morris, Burne-Jones, Rossetti and the many lesser men belonging to the Pre-Raphaelite school. Like them, he painted allegorical and mythological subjects, designed wall-papers and tapestries, illustrated his own books and those of other writers, all with equal facility. He was one of the leaders of the Arts and Crafts movement, and was also associated with Morris in the work of the Kelmscott Press. He is perhaps most widely known as an illustrator of books for children, including *Baby's Opera, Pan-Pipes, Flora's Feast, Grimm's Household Stories* and *Don Quixote.* Paintings from his brush have found a place in many of the great galleries of Europe. Among them must be mentioned the portrait of himself in the Uffizi Gallery, Florence; the *Renascence of Venus,* in the Tate Gallery, London; and the *Fate of Persephone,* in the gallery at Karlsruhe, Germany. His memoirs were issued under the title, *An Artist's Reminiscences.* See Arts and Crafts.

CRANIAL NERVES. See subhead under Nervous System.

CRAN'MER, Thomas (1489-1556), the first Protestant Archbishop of Canterbury, famous for his activity in promoting the English Reformation during the reign of Henry VIII. In 1523 he received his degree of Doctor of Divinity from Jesus College, Cambridge, and was appointed lecturer on theology. He

brought himself favorably to the notice of the king by suggesting that the question of the latter's divorce from Catharine of Aragon be submitted to the European universities; later he was a pliant servant of his sovereign in the divorce proceedings, in the elevation of Anne Boleyn as Henry's second wife, and in the downfall of herself and Henry's fourth wife, Anne of Cleves.

Cranmer was consecrated Archbishop of Canterbury in March, 1533, shortly after the king's marriage to Anne Boleyn, and actively supported Henry in his efforts to check the power of the Pope. He also encouraged the translation of the Bible, and caused it to be read in the churches. By the will of Henry VIII, he became one of the regents for the youthful Edward VI, and had an important part in the advancement of Protestantism during the latter's reign.

When Mary came to the throne, the archbishop was sent to the Tower, together with his fellow Protestant workers, Latimer and Ridley (see LATIMER, HUGH; RIDLEY, NICHOLAS). In 1554 they were removed to the common prison at Oxford, on the charge of heresy. Cranmer's sufferings so weakened him that he signed several statements repudiating his former acts, but at the end he regained his courage and showed great fortitude while suffering martyrdom at the stake. When the fire was lighted he thrust into it the hand which had signed his recantations and exclaimed, "This hath offended; oh, this unworthy hand."

Related Subjects. The important events centered about Cranmer are further described in various articles in these volumes, as follows:

Boleyn, Anne
Catharine of Aragon
Henry, subhead
Henry VIII
Reformation (English phase)

CRAN'STON, R. I., a residential city in Providence County, situated northeast of the geographical center of the state, about nine miles southwest of Providence. Railway transportation is provided by the New York, New Haven & Hartford Railway; electric lines run to Providence and other neighboring cities. The town was settled as a part of Providence in 1638, was incorporated as a separate town in the year 1754 and as a city in 1910. It was named in honor of Samuel Cranston, a former governor of Rhode Island. In 1910 the population was 21,107. According to Federal estimate in 1920 it was 29,407. The area is thirty square miles.

Cranston is the residence of a large number of people who have business interests in Providence. It is composed of several prosperous villages with many attractive homes, and its people are largely engaged in making cotton and print goods, and in brewing. In the southern part of the city are the state's prison, workhouse, almshouse, hospital for the insane, house of correction and reform school, and the county jail. Cranston has four libraries.

CRAPE, or **CRÊPE,** *krape,* the cloth of mourning in many countries, a crinkled, wiry, transparent stuff made of well-twisted raw silk. When woven, it is gummed, and in drying the threads partly untwist, giving the wrinkled appearance. It was first manufactured and used in Bologna, Italy. It is usually dyed black, but is also made in other colors.

Japanese and Chinese crape, or crêpe de chine, is a soft, gauzy silk fabric with a wavy appearance, very popular for ladies' scarfs, shawls, hat trimmings, lingeries and evening gowns, and is manufactured in all shades and colors.

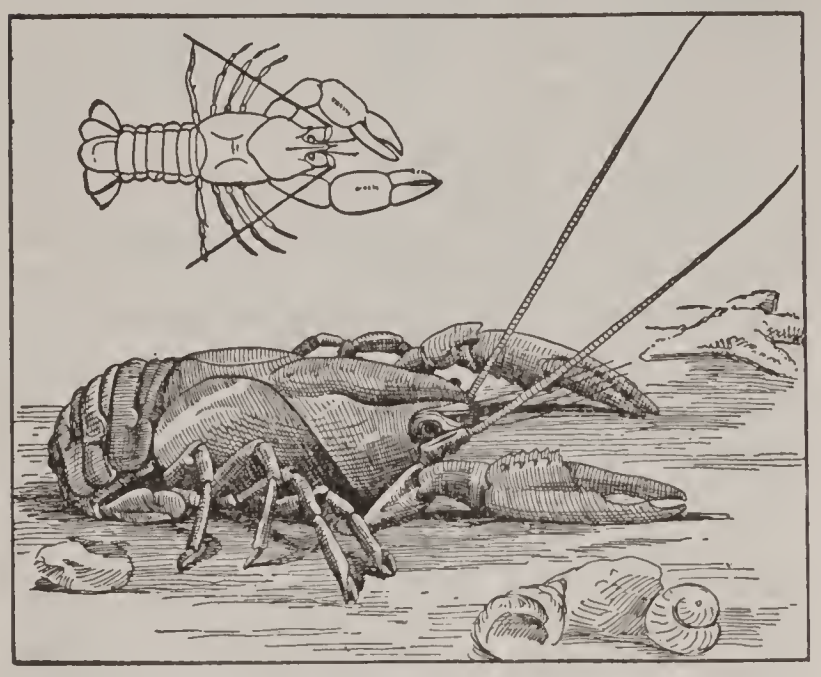
Crape cloth is a woolen fabric made in imitation of the silk, the crinkled surface being produced by running the cloth through rollers. Crape paper, so much used for decorative purposes, is a crinkled paper resembling the crape cloth.

CRASSUS, *kras'us,* MARCUS LICINIUS (about 115-53 B. C.), a Roman surnamed Dives, the Rich. He was exceedingly fond of wealth and skilful in the ways and means of accumulating it. When Sulla, the merciless leader, landed in Italy, 83 B. C., Crassus joined him and rendered such important service that he was allowed to purchase confiscated property and estates at a nominal value. In 71 B. C., he was created praetor and took command against Spartacus and the revolted slaves. In 70 B. C., Crassus was elected consul, having Pompey, whom he hated, as his colleague; was made censor in 65 and with Caesar and Pompey was a member of the first triumvirate in 55. He was slain through treachery of the Parthians. See TRIUMVIRATE; PRAETOR.

CRAW'FISH, or **CRAY'FISH,** a freshwater, lobsterlike shellfish. The young are carried under the broad tail of the mother in the same way as are the lobsters, and the general structure of the animal is the same. The crawfish is smaller than the lobster, however, being about six inches long. The claws are much shorter, and the tail is different, in that the middle plate of the tail fin is divided

crosswise by a suture or kind of seam. The color is greenish-brown.

Crawfish are abundant in fresh waters of America, Europe and Northern Asia, and in some of England's streams. At night they come from burrows in grassy banks or from



CRAWFISH

under stones and catch mollusks, small fish or the young of water insects. Like the lobster, the crawfish is a fighter; if an eye, or one of its four pairs of legs, or one of the two pincers or claws is lost in battle, a new member soon grows in its place.

In Europe crawfish are esteemed as food, but in America they are seldom eaten. They cause great damage on the lower Mississippi by their burrowing habits, weakening milldams and levees. See LOBSTER.

CRAWFORD, FRANCIS MARION (1854-1909), an American novelist whose remarkable power of description and graceful, vivid style have won him wide popularity. He was the son of Thomas Crawford, the sculptor, and was born in Italy. His education was received in America, England and Germany, and at Rome he studied Sanskrit. He went to India as a journalist, and during 1879 and 1880 was editor of the *Indian Herald* at Allahabad, India. Two years later his first novel, *Mr. Isaacs,* a story of modern India, brought him fame in three continents; the rich romance and the picturesque settings were new and welcome to the reading public. *Dr. Claudius, A Roman Singer, Zoroaster* and *A Tale of a Lonely Parish* followed during the next four years, and then appeared a series of stories of modern Rome, *Saracinesca,* which have been regarded as his most important works. But later ones, including *Marietta, a Maid of Venice, In the Palace of the King, Whosoever Shall Offend* and *The White Sister,* have been eagerly read. In recognition of Crawford's ability the French government presented him with a gold medal.

CRAWFORD, ISABELLA VALANCEY (1851-1887), a Canadian poet, whose works received little notice in her lifetime but are now among the most popular Canadian verse. She was born in Dublin, Ireland, of poor parents, who moved to Canada in 1858. Miss Crawford's life was a long, hard struggle against poverty on the one hand and against public indifference on the other. A small volume of her poems, entitled *Old Spookses' Pass, Malcolm's Katie and Other Poems,* appeared in 1884. Her collected poems were not published until nearly twenty years after her death.

CRAWFORD, THOMAS (1814-1857), the American sculptor who made the impressive bronze statue of *Liberty,* which stands nineteen and a half feet high above the dome of the Capitol in Washington, D. C. He was born in New York City, where he began his studies, but when twenty years old he moved to Rome, Italy, to become the pupil of Thorwaldsen. His studio there was a popular meeting place of lovers of art. Although his life was short and he had lost his sight a few years before his death, he has left many pieces of work expressing poetic imagination and nobility and originality of design. The equestrian monument of Washington at Richmond, Va., and various other statues of noted men, such as *Beethoven* and *Clay,* as well as *Orpheus and Cerberus, Adam and Eve After the Expulsion, Hebe and Ganymede, Mercury and Psyche* and *The Indian,* are especially interesting.

In the article WASHINGTON (D. C.) a picture of the bronze *Liberty,* referred to above, is printed.

CRAWFORDSVILLE, IND., the county seat of Montgomery County and a manufacturing city, situated northwest of the geographical center of the state, on Rock River. Indianapolis is forty-five miles southeast, Lafayette is twenty-eight miles north and Chicago is 147 miles northwest. The Vandalia, the Chicago, Cleveland, Cincinnati & Saint Louis, and the Chicago, Indianapolis & Louisville (Monon) railways serve the city, and connection with Indianapolis, Lebanon and other cities in the state is made by the Interurban Traction System. Crawfordsville was settled in 1822 and incorporated as a city in 1865. In 1920 the population, chiefly American, was 10,139, an increase of 768 since 1910. The city covers an area of three and one-half square miles.

Crawfordsville presents an attractive appearance; it is on a high bluff above Rock River, which winds around the city. It has in addition to its public schools Wabash College (Presbyterian), established in 1832, Saint Charles Academy, a business college and a Carnegie Library. A $65,000 Federal building, the high school and Y. M. C. A. buildings, costing $100,000 each, and the Ben Hur and Knights of Pythias buildings are among the noteworthy structures of the city. It is the trade center for a rich agricultural region, and its various manufactories employ about 1,200 people. The leading industry is that of making matches; wire and wire nails, wire-bound boxes, brick and furniture are also extensively manufactured. In 1920 there were 55 manufactories, employing $2,290,000 capital, with a product of nearly $5,000,000 yearly. Crawfordsville was the home of Lew Wallace, soldier, statesman and distinguished author; his home and a monument to his memory are interesting features of the city. R.W.W.

CRAYFISH. See CRAWFISH.

CRAYONS, *kra'onz,* pencils of charcoal, chalk or a fine paste of chalk or pipe clay, colored with various pigments. They reach the market in all colors and tints. Such crayons are used for drawing on paper, wood or on other materials such as school blackboards.

Pastels, or crayon paintings, are more quickly made than oil or water color paintings and are softer and richer in effect, but they soil easily and must be kept under glass. In pastel work sometimes the colors are first rubbed on the paper with the fingers, then the outline is finished with crayons. Charcoal crayons are used principally for drawing faces and the human figure. Crayons used in lithography are smooth and greasy, and usually made of a mixture of wax, soap, resin and lampblack.

CREAMERY, an institution of American origin, is a factory where butter is made. The first creamery known began operations in 1861, in Orange County, N. Y. Ten years earlier the first cheese factory had been erected in this same region, and its success led directly to the adoption of factory methods in making butter. The creamery system spread rapidly to other dairying sections of the United States and also to foreign countries. Wisconsin is the leading producer of creamery butter, and is closely followed by Minnesota and Iowa. These three states furnish nearly 400,000,000 pounds, or twenty-five per cent, of the creamery output of the United States. Ontario and Quebec divide over ninety per cent of the Dominion's production of creamery butter between them.

Organization. Creameries are organized on three plans. Coöperative creameries are owned by the farmers, or "patrons," who usually choose from their own number a committee to operate the factory. The cost of operation and the proceeds of the sales are divided among the patrons in proportion to the amount of milk, of cream or of butter fat in their consignments. A second form of organization involves the formation of a stock company, all the stock being owned by the patrons who deliver milk to the factory. Under a third plan, the farmers sell their milk or cream outright to the private owners of the creamery. The owners operate it for their own profit, and in so doing relieve the dairyman of the necessity of finding a market for his product.

Plan of Operation. Whatever the form of ownership, the farmers may deliver the milk to the creamery, where the cream is separated by machinery, or they may raise or separate the cream at home and send it to the creamery every two or three days. Formerly a large number of creameries established skimming stations at points convenient to the farmers; there the milk was run through a separator and the skimmed milk returned to the patrons. The farmers were formerly paid by the weight or quantity of the milk or cream, but now usually by the amount of butter fat as determined by the Babcock test.

A well-equipped creamery has the apparatus for testing milk and cream, a vat or series of vats for receiving milk, and other vats for holding the cream and the skim-milk. The cream separator is usually operated by a motor driven by a steam or a gas engine or by electricity. Some of the largest creameries have a capacity of twelve to fifteen tons of butter a day. Creamery butter, generally considered, is a vast improvement over the ordinary farm methods. The milk and butter are handled by experienced men, who use machinery which reduces the cost of production and also makes it easier to maintain a uniform quality. The payment for cream on the basis of butter fat has also stimulated the farmers to keep better cows, or cows better suited to the purpose for which they are kept. E.H.F.

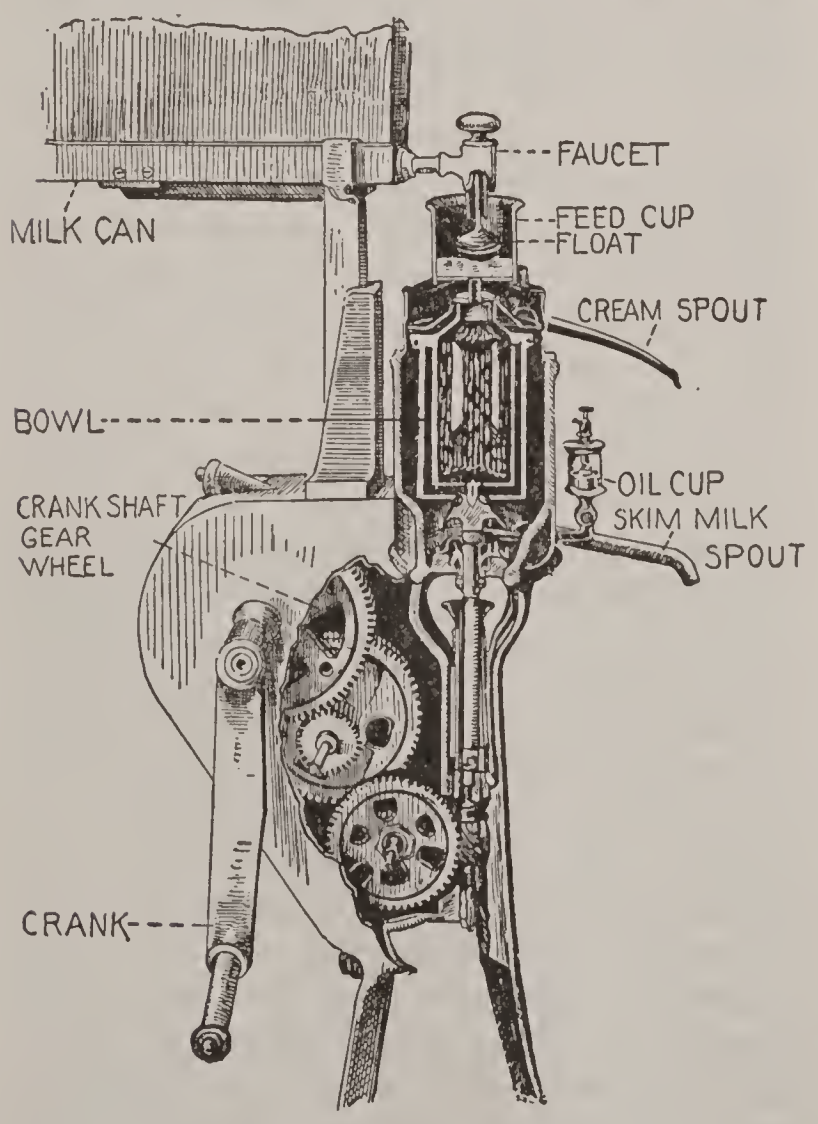
Related Subjects. The reader is referred to the following articles in these volumes:

Butter
Cattle (Dairy Type)
Cream Separator
Dairying
Milk, subhead
Babcock Test

CREAM OF TARTAR, or **POTASSIUM BITARTRATE,** *po tas'i um bi tar'trate,* a white, crystalline compound of tartaric acid and potassium, which exists in grapes, tamarinds and other fruits. It is used in making that necessary household article, baking powder. It is prepared from the sediment in wine barrels called *argol.* This argol is dissolved in hot water, and the coloring matter is removed by means of clay or egg albumen. After purifying by crystallization, it is ready for the market. If cream of tartar could be made direct from the juice of the grape, without undergoing the above process, it would increase the value of grape crops, and a California association has offered a prize of $25,000 for the discovery of a method of doing this.

Cream of tartar is also used in medicine as a purgative, in dyeing to fix colors, in the making of candies, and combined with sodium bicarbonate it is the common substitute for yeast in baking. See BAKING POWDER. S.L.A.

CREAM SEP'ARATOR, a machine for separating cream from milk. There are numerous patterns of this machine, but all operate on the same principle. The cream is lighter than the other parts of the milk. We all know that when a body is whirled rapidly it has a tendency to fly off in a straight line, and that the heavier the body the stronger is the tendency. If a boy hurls a paper ball and a stone from a sling the stone will be thrown much farther than the ball. The cream separator operates on this principle. The milk flows into a bowl or drum, which is made to revolve at a high rate of speed, from 5,000 to 8,000 revolutions per minute. The heavier parts are thrown to the outer rim of the bowl and the cream collects at the center. There are two spouts, one for the cream and the other for the milk. The best results are obtained when the milk has a temperature of about 85° F. With a good machine practically all the cream is obtained.



CREAM SEPARATOR

Cream separators may be operated by hand power, electric power, water or steam power or animal power. Good small separators for use on a farm can be purchased for about $35. The capacity of these separators is about 200 pounds of milk per hour. Butter factories and large dairies use larger machines. An even rate of speed is necessary to the most successful work; therefore a motor is more desirable than man power. The cream separator requires care in operating and handling, and the parts must be kept scrupulously clean. The illustration shows the principal parts of the machine.

See the references following the article CREAMERY, for related subjects.

CREASY, EDWARD SHEPHERD. See FIFTEEN DECISIVE BATTLES.

CRÉCY, *kra se',* a town in France, near which, in 1346, was fought the first important battle of the Hundred Years' War (which see). There the English forces of Edward III, numbering 19,000, totally routed a French army of 60,000, commanded by Philip VI. About half of the French army perished, and among the slain were over a thousand knights, the flower of the chivalry of France. The aged King John of Bohemia, who had fought for Philip, was also slain; his crest of three ostrich plumes and motto *Ich dien,* meaning *I serve,* were adopted by Edward's son, the Black Prince, the hero of the day. The Battle of Crécy is especially notable in that it proved the superiority of the common soldier to the armor-clad knight, and so contributed to the fall of feudalism and chivalry. It was also one of the first battles at which the English soldiers used gunpowder.

CREDIT, *kred'it.* The gigantic structure of modern industry and commerce is based on credit. Credit is the life-blood that nourishes all the great as well as the small undertakings

we see around us. Without it the building of railways, the development of natural resources, the establishment of great factories and the growth of towns, to give only a few examples, would have been impossible.

The word is derived from the Latin verb *credere,* which means *to trust.* Credit is primarily based on the confidence placed in the honor and ability of a purchaser or of a debtor to pay for his purchases at some future time, or to meet his obligations. This form of personal credit is illustrated in the so-called "trust," or book accounts, allowed by many retail merchants to their customers.

In large commercial transactions credit is given upon the deposit of security, which usually takes the form of promissory notes, bills, drafts, mortgages or bonds. These are called *instruments of credit,* and through them the creditor establishes claims to a portion of the debtor's estate and thereby assures himself of the repayment of his debt. Through a well-organized system of credit it is possible to carry on a great number of enterprises with a comparatively small amount of money. An effective organization of credit draws out wealth and increases its usefulness. It is in this way that modern banks play such an important part in the development of the industry and commerce of a country. Banks are reservoirs of credit. They collect wealth which lies idle in the hands of a great number of persons, and then loan it to those who can offer security for its repayment and are able to use it to the best advantage. See BANKS AND BANKING.

The term *public credit* signifies the confidence which men feel in the ability and disposition of a nation to pay its debts. See NATIONAL DEBT.

CREDIT, LETTER OF. If a person is going to journey in a foreign country he must arrange to have money at his command, wherever he may be. To carry gold and silver is out of the question, and for large amounts notes and checks are often inconvenient. But if he carries a letter from a bank which says that up to a certain sum the bank will repay whatever money a foreign bank may be asked to furnish, he may at any time draw any amount, large or small, which suits his convenience. Sometimes such a letter of credit is addressed only to one banker, but for tourists a more suitable form is the *circular* letter, good in almost any part of the world. The letter carries the person's description, so that if lost it is valueless to the finder. When money is thus obtained in a foreign country the banker pays in the current rate of exchange (see EXCHANGE) and inscribes on the letter, both in the currency of his nation and in that of the tourist, the amount given. If at the journey's end the sum named in the letter has not been exhausted the balance is returned by the bank of issue.

CREDIT MOBILIER OF AMERICA, *kred'it mo beel'yer,* a joint stock company organized in 1865 for the purpose of constructing the Union Pacific Railroad. The actual construction work cost the company a little less than $51,000,000, and the cash and securities which it received as payment from the railroad company amounted to $94,650,000. The difference between these amounts—$43,929,000—was profit in the pockets of the Credit Mobilier stockholders, who were also the promoters and chief stockholders of the Union Pacific Railroad Company. The exposure of these facts, and the bribery which was used in an attempt to conceal them, formed a serious political scandal.

The Credit Mobilier of America was chartered by Pennsylvania to do a general loan business. In the next year control of the company was purchased by the promoters of the Union Pacific. The railroad company had just been chartered by the government of the United States, which offered to give it a land grant valued at $50,000,000, and to lend it $16,000 to $48,000 a mile for construction. These great inducements, however, resulted in few and small subscriptions from outsiders. Prominent among the railroad promoters were Oakes Ames, a Representative from Massachusetts, and John A. Dix, later governor of New York; these men realized that the government's subsidy and loan was approximately double the amount which would be required to build the road. To get all of this subsidy they gave the contract for construction to the Credit Mobilier of America, of which they were the owners, and in payment for the work gave stock of the railroad company and the bonds issued by the government as a loan.

The plan worked well. Credit Mobilier stock was worth about five cents on the dollar in 1864; in 1868 the earnings began to be distributed and in a short time the stock was worth three, four and five times its par value. In one year, 1868, the company's dividends amounted to 430 per cent. The sudden rise in the value of Credit Mobilier stock led to quarrels among the promoters and finally to a

Congressional investigation. Oakes Ames and others of the promoters, in an attempt to prevent the investigation, disposed of Credit Mobilier stock at less than half its market price to members of Congress and government officials, and even loaned them the money to pay for it. These transactions were exposed in 1872, to the consternation of the country, which saw its Vice-President and other high officials convicted of accepting bribes. After much excitement Congress censured two of its members and one of the government directors of the railroad, but no further action was taken.

The name *Credit Mobilier* (*kra de' mo be lya'*) was taken from that of a French banking firm which loaned money on movable—that is, personal—property. The Credit Mobilier in Paris was established in 1852 and was one time a powerful organization, but the extravagant speculation of its promoters brought it to ruin in 1869, although the promoters made large fortunes. W.F.Z.

CREE, *kree,* a tribe of Indians belonging to the Algonquian family and living in Canada, where they formerly occupied a large portion of Manitoba and Saskatchewan, extending their territory northward to Athabaska Lake. They have always been friendly with the whites and have retained trade relations with the Hudson's Bay Company (which see) since its organization. As civilization encroached upon them they sold their lands to the Canadian government and were placed on reservations, where about 10,000 of them now live. For customs and habits see INDIANS, AMERICAN.

CREED, *kreed,* what one believes concerning a definite line of action or policy. If a man says, "I believe honesty is the best policy," that constitutes his business creed in dealing with others. Creeds are usually associated with religion, but they can just as appropriately be associated with any other beliefs. One may have a political creed or an educational creed, as well as a religious creed.

The creed of any Church contains the articles of faith which the communicants of that Church accept. From this viewpoint there are as many creeds as there are religious denominations. All these, however, are derived from a few established by the early Church. The first is the Apostles' Creed (which see), so called because it is supposed to have originated with the Twelve Apostles. The next in importance is that adopted by the Council of Nice, called the *Nicene Creed* (see NICE, COUNCILS OF). Later the Council of Trent and the Council of the Vatican added several articles to this creed, so that it included all the articles of faith of the Roman Catholic Church.

No other creeds were adopted until the Reformation, in the sixteenth century. As a result of that movement (see REFORMATION), the Lutheran Church has the *Symbolic Book of the Evangelical Church;* the Church of England has the *Thirty-nine Articles* and the Presbyterian Church the *Westminster Confession of Faith.* The creeds of all Protestant denominations consist of modifications of one or more of these creeds, and they are practically the same in their main features.

Two Creeds. Following are two famed creeds, one particularly for teachers, by Edwin Osgood Grover, the other by William Henry Channing:

The Teacher's Creed

I believe in boys and girls, the men and women of a great to-morrow; that whatsoever the boy soweth the man shall reap.

I believe in the curse of ignorance; in the efficacy of schools; in the dignity of teaching; and in the joy of serving others.

I believe in wisdom as revealed in human lives as well as in the pages of the printed book; in lessons taught, not so much by precept as by example; in ability to work with the hands as well as to think with the head; in everything that makes life large and lovely.

I believe in beauty in the schoolroom, in the home, in daily life and out-of-doors.

I believe in laughter; in love; in faith; in all ideals and distant hopes that lure us on.

I believe that every hour of every day we receive a just reward for all we are and all we do.

I believe in the present and its opportunities; in the future and its promises; and in the divine joy of living. EDWIN OSGOOD GROVER.

My Symphony

To live content with small means; to seek elegance rather than luxury, and refinement rather than fashion; to be worthy, not respectable, and wealthy, not rich; to study hard, think quietly, talk gently, act frankly; to listen to stars and birds, to babes and sages, with open heart; to bear all cheerfully, do all bravely, await occasions, hurry never—in a word, to let the spiritual, unbidden and unconscious, grow up through the common. This is to be my symphony.

WILLIAM HENRY CHANNING.

CREEKS, *kreeks,* one of the strongest old Indian confederations south of New York, consisting of several tribes, of which the Muskogee was the largest and most influential. They occupied most of Alabama and Georgia, and took their name from the large number of rivers in their country. They were an agricultural people, but were also warlike. Their country bordered upon the English, Spanish and French settlements, and each of these nations tried to gain their friendship. They

favored first one, then another, until the English became supreme. During the Revolutionary War they fought with the English, and after the war many Tories settled among them and caused them to continue their hostility towards the United States. In the War of 1812 part of them became openly hostile, bringing on the Creek War of 1813, during which they caused the massacre at Fort Mims. The Creeks were severely punished.

In 1832 they sold all they had left to them east of the Mississippi River and removed to Indian Territory, where, for a time, they resisted all attempts to civilize them. During the War of Secession they furnished men to both armies, but those favoring the Union cause were driven into Kansas, where many perished. The bulk of the Creeks now reside in Oklahoma, though there are a few small groups in Alabama and other states. They number about 6,900 of pure Indian stock, but there are many among them of a mixed race. For customs and habits, see INDIANS, AMERICAN; also, FIVE CIVILIZED TRIBES.

CREEPER, *kreep'er,* the name of a family of small, busy birds much like the nuthatches in their habit of climbing trees. Most creepers are found in Europe, but the common brown creeper is also seen in North America, being especially abundant in Southern Canada. It is smaller than the sparrow, and its brown plumage, streaked with white, looks almost like the rough bark of the trees it climbs. It is grayish-white beneath, however. This remarkably active bird circles a tree from the base upward by means of its strong feet and twelve stiff tail feathers, and conscientiously picks from the bark with its slender, curved bill and sharp-pointed tongue every spider egg or insect it can find. Then it drops to the ground and works its way up another tree. It has a "wild, sweet song," usually heard, however, only when the bird is making its nest of moss, feathers and fine twigs behind a piece of bark.

THE CREEPER

CREMATION, *kre ma'shun,* the act of burning bodies of the dead instead of burying them, a practice which has passed down the generations from prehistoric times. It has been long advocated throughout America and Europe, and many cremation societies have been organized. At present Germany leads in the movement. Although the practice is objected to for sentimental reasons, and the Roman Catholic Church is actively opposed to it, its economic values are by no means small. Cremation lessens the spread of disease, and in some parts of the world removes the necessity of using for burial purposes land which is really needed for a growing population. Cremation, of course, removes all trace of crime and for that reason is objected to by those whose duty it is to enforce laws. Insurance companies, too, have found that proofs of death by poisoning, etc., have been removed by cremation and money may thereby be secured fraudulently. But the hygienic good tends to make the practice widespread.

The present method of cremation is as follows: After the name plate and handles have been removed, casket and body are placed in a specially-constructed furnace and subjected to intense heat, 2,000° to 2,500° F., but not to direct flames. Where obtainable, gas is used as fuel, but coal is usually employed. After a few hours the casket and clothing have changed to gaseous products and light ash, and about four pounds of pure bone ash remain. The latter is placed in an urn, sealed and labeled, and delivered to relatives of the deceased. The building in which cremation takes place is called a *crematorium;* it is usually located in a cemetery; nearly every large city has at least one. The cost of cremation varies, but averages about $25.

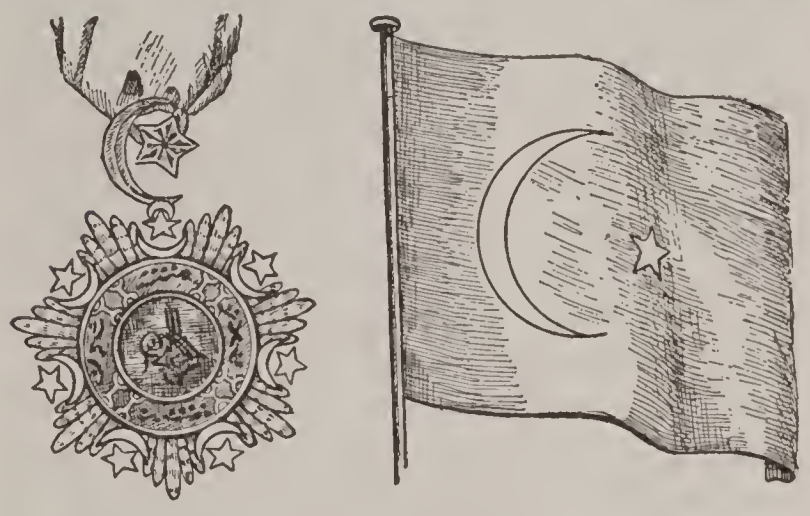
CREOLE, *kre'ohl,* a term applied to the descendants of Europeans born in the West Indian Islands, the southern parts of the United States, the Island of Mauritius, and other sections of the world colonized by Spain or France. The term implies purity of European blood, either Spanish or French, unmixed with that of other people, and must not be confused with mulatto (which see).

CREOSOTE, *kre'o sote,* the name given to a certain product of wood tar, extracted by a tedious process of distillation. It was discovered in 1832 by Riechenbach. For medicinal purposes, that derived from beech wood

tar has been found most desirable. In its pure state it is heavy, colorless and oily, and has a penetrating, distinctive odor. As an antiseptic (which see), its action is similar to that of carbolic acid. Apart from its medicinal value, it is in great demand commercially for its preservative qualities. Wood soaked in creosote will not rot for many years, hence it is extensively used for treatment of railroad ties and other timbers.

CRÊPE, *krape.* See CRAPE.

CRESCENT, *kres'ent,* a universal symbol of growth and progress, and, in one instance, of governmental power. Its use as such was inspired by that beautiful thing of the heavens, the curved, silvery crescent new moon, with its



THE CRESCENT

At left, emblem of the Turkish Order of the Crescent; at right, the merchant flag of Turkey, described in accompanying article.

thickened center and its tapering horns upturned, from which form it expands into the glorious full moon. The moon goddesses worshiped by the Egyptians and the Greeks were decorated with the crescent symbol. Athenians and Romans of high rank were permitted to wear crescents of silver and ivory.

The crescent was the emblem of the ancient Greek city Byzantium, which became Constantinople. Since the establishment of the Turks in Europe, especially since 1453, when Constantinople was captured, it has been the universal emblem of their empire, the crescent and a star in white on a red background constituting the Turkish flag. The Order of the Crescent, a Turkish order of knighthood, was instituted in 1799 by Sultan Selim. As the cross is the emblem of Christianity, so is the graceful crescent the emblem of Mohammedanism. The Red Cross banners of other countries were not adopted by the Turkish Red Cross Society; its banner bears the red crescent on a white field.

Crescent City is a nickname for the city of New Orleans, because formerly most of it lay in a great crescent-shaped bend of the Mississippi River.

CRESS, *kress,* a name given numerous plants whose foliage has a pungent taste and is used as salad or garnishing. *Watercress* is most popularly known, and its smooth, bright-green, round-lobed leaves on long slender stems are prized as cold-weather salad in America and Europe. It is native in most parts of the world, growing best in clear, shallow running water with a sand or gravel bottom. Common, or *garden, cress,* also called *pepper-grass,* is cultivated in American and European gardens for garnishing purposes. It is a powerful remedy for scurvy. *Virginia cress* is used in North America and the West Indies as a salad and as a medicine to produce perspiration. Common *winter cress, American cress* and common *bitter cress* are also widely cultivated in North America and Europe.

CREST, *krest.* See HERALDRY.

CRETACEOUS, SYSTEM, or **CHALK SYSTEM,** in geology, is the system of rocks which contains the great chalk beds, from which it takes its name. It lies between the Jurassic system below and the Eocene above, and is the final system of the Mesozoic Era. Geologists now divide the system into the Lower and Upper Cretaceous, and some give the name Comanchean, or Shastan, to the Lower. The system is very extensive, and while it takes its name from the chalk formations in England and France, these form only a very small portion of it. During the period a great inland sea extended from the Gulf of Mexico to the Arctic Ocean, dividing North America into two unequal parts, the eastern being the larger. The rocks of the Lower Cretaceous are prominent in Mexico, Arizona, California and British Columbia. Those of the Upper are more prominent in the eastern part of the continent and in the Mississippi Valley, extending northward into Alberta and Saskatchewan and as far as the mouth of the Mackenzie River.

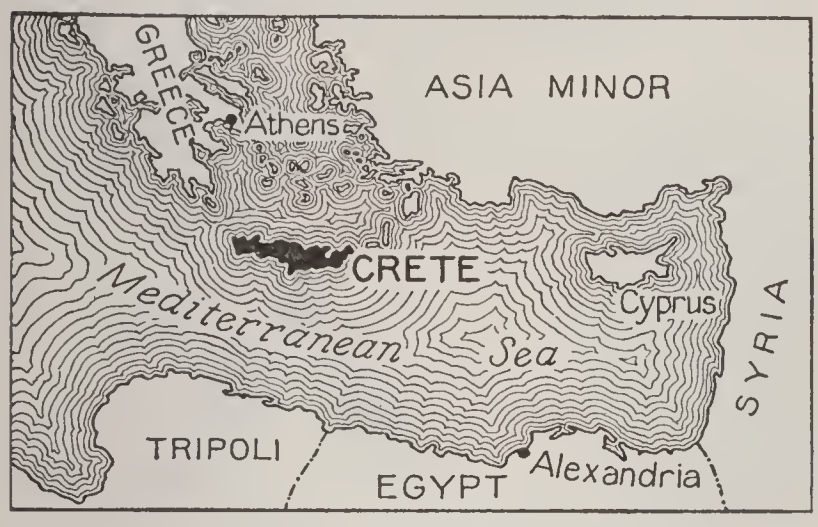
Most of the rocks were formed under water, and they include extensive formations of chalk, sand, clay and gravel, together with iron and lignite, but the latter in such small quantities that it is of no commercial value. Plants and animals were abundant. Many species of trees now living first appeared during this period; among these are the birch, the pine of the southern hemisphere, the oak, the walnut and the maple. Among the animals were flying reptiles which resembled huge bats; birds with

teeth set in sockets; sea serpents and land reptiles of great size.

Related Subjects. The reader is referred to the following articles in these volumes:

Chalk	Jurassic Period
Geology	Mesozoic Era

CRETE, *kreet.* Below the southern end of the Aegean Sea, about sixty miles from the Grecian mainland and not quite twice as far from the shores of Asia Minor, lies the island of Crete, famed during all the ages that man



LOCATION MAP

has lived. Three thousand years ago Ulysses thus described it to Penelope:

> Crete is a region lying in the midst
> Of the black deep, a fair and fruitful land,
> Girt by the waters. Many are the men,
> Nay, numberless, who make it their abode,
> And ninety are its cities. Different tongues
> Are spoken by the dwellers of the isle.

Centuries before Homer's time Crete was the home of kings whose fleets held sway over the eastern Mediterranean, and of a people whose civilization influenced Egypt, Syria, Greece, Sicily and even the Adriatic lands about Venice. Cretans taught the Phoenicians, the fathers of our alphabet, how to write.

The island is about 160 miles long and has an area of 3,365 square miles. Its mountains run from end to end, rising to a height of 8,000 feet in Mount Saint Theodore and Mount Ida, famed in Greek mythology as the birthplace of Jupiter. The three chief towns are Canea, Retimo and Candia. Near the last was—

> Cnossus, where the monarch Minos dwelt,
> He who at every nine years' end conferred
> With Jove Almighty.

Among the ruins of Cnossus is the great labyrinth built by Daedalus, where events actually occurred which gave rise to the legend of Theseus and the terrible minotaur. So wonderfully was the ancient city constructed that its stone sewers, now 4,000 years old, are still fit for use.

Since 1912 Crete has been a part of Greece. Once it was included in the Roman Empire, then fell successively under the rule of Byzantines, Venetians, Turks and Egyptians. In 1840 it became Turkish again, but because most of its 350,000 people are Christians there was continuous anarchy, and in 1898 the Turks gave way to a high commissioner of England, France, Italy and Russia. The people demanded and several times proclaimed union with Greece. Eleutherios Venizelos, their leader, became Premier of Greece and organized the Balkan League against Turkey; in the ensuing war Cretans fought beside Greeks and in 1913 the powers withdrew their government.

Related Subjects. The reader is referred to the following articles in these volumes:

Ariadne	Minos
Daedalus	Minotaur
Jupiter	Theseus
Labyrinth	Venizelos, Eleutherios

CRETONNE, *kre tahn',* originally a soft, white hemp and linen cloth, now a cotton cloth either twilled, creped, basket-woven, or with dots or other raised figures, on which an attractively-colored pattern is printed. Colors on such an uneven surface produce a rich, soft effect, unlike the distinct bright colorings of chintzes. Floral designs usually are the most popular and are printed on a white or colored background, sometimes each side having a different pattern. In cheaper cretonnes the thick threads used are commonly formed of waste cotton.

Cretonnes are used for many purposes, whole rooms often being decorated with the cloth, from window hangings to the furniture covering, scarfs, tray linings, etc. It is also used for bags of many varieties—laundry bags, hat bags, work bags—and for garden dresses and hats. The prices of this material range from 25 cents to $5 a yard.

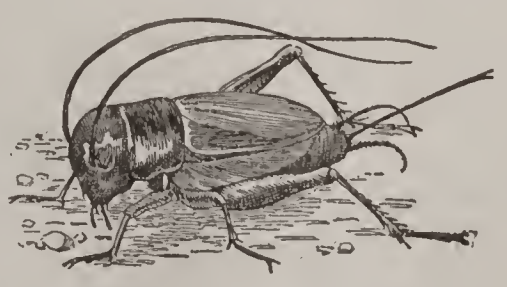
CRIBBAGE, *krib'aj,* a popular game of cards which does not invite gambling. It is a game of skill, requiring careful calculation and observation. A full pack of fifty-two cards is used, and the players may number two, three or four. The most popular game is between two players. The cards are cut to decide who shall deal. The winner of the cut then shuffles the cards and deals six cards to his opponent and six to himself. The remaining cards are then cut and one card is placed face up on the table as the "turn up," the use of which is explained later. Each player studies his hand and takes out two cards

which he places on the table to form the *crib*. Court cards all count ten, other cards according to their pips or spots.

The non-dealer plays a card, calling its value as he does so. For example, he may start with the nine of diamonds, saying "nine" as he lays it down. The object is to make a score of sixty-one by means of *pairs, sequences* and *fifteens,* or the *go*. The opponent, when the nine is played, may put down another nine and claim two for a pair, or failing that, he may play a six and claim two points for making fifteen. Whatever card he plays, its value is added to the other cards played until thirty-one is reached or the opponent cannot play without running beyond that number. A sequence consists of a run of three or more cards and one point for each card is claimed. If all the cards in a hand are of one suit a flush is claimed and one point is marked for each card. When all cards have been played the non-dealer counts the points in his hand, counting two for each combination of fifteen, two for each pair, and so on. The turn-up card may be used in any combination, and is added for counting purposes to the cards of each player. The dealer then does the same with his hand, and also with the crib consisting of the cards taken out of the two hands. If a knave is turned up after dealing, the dealer claims "two for his heels." If a player holds the knave of the same suit as the turn-up card he claims "one for his nob." Marking is done on a board pierced with two rows of holes for each player. Each double row totals sixty, there being one extra hole at each end of the board called *home*. F.ST.A.

Consult *Hoyle's Games,* for the particular details of the game.

CRICKET, *krick'et,* a blackish or brownish insect, about an inch long. Its merry *re-teat, re-teat,* has been characterized in literature by Burroughs as a "rhythmic beat," by Thoreau as "slumbrous breathing" and as "audible stillness," by Hawthorne, who adds, "If moonlight could be heard it would sound like that." This little insect likes a warm home in the crevices of old-fashioned fireplaces, so it has become associated with the crackling fire and the steaming kettle. Cowper describes its tune as—

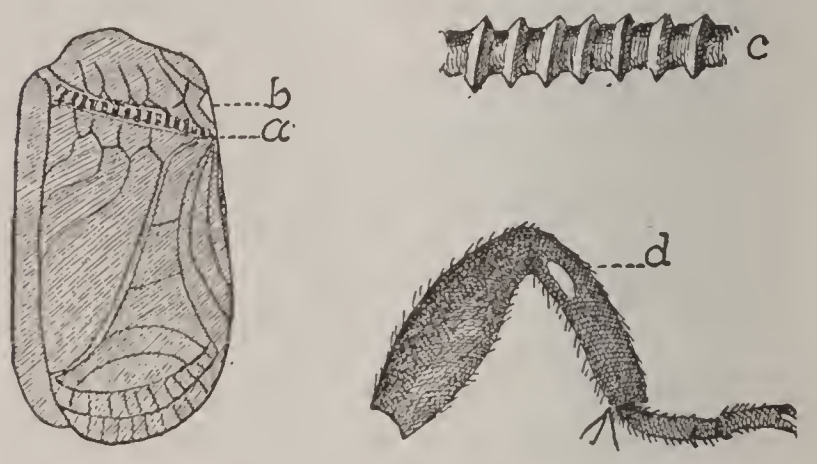


COMMON CRICKET

"Sounds inharmonious in themselves and harsh,
Yet, heard in scenes where peace forever reigns,
And only there, please highly for their sake."

In Dickens' beautiful Christmas tale, *The Cricket on the Hearth,* one of these chirping creatures sings only when things are running smoothly, but in times of sadness and trouble is silent.

It is the male cricket which produces sound. A filelike ledge on one wing is rubbed on a rough surface of the other. When it is not calling to its mate in that way, the wings are folded along its flat back. Crickets have feelers, or

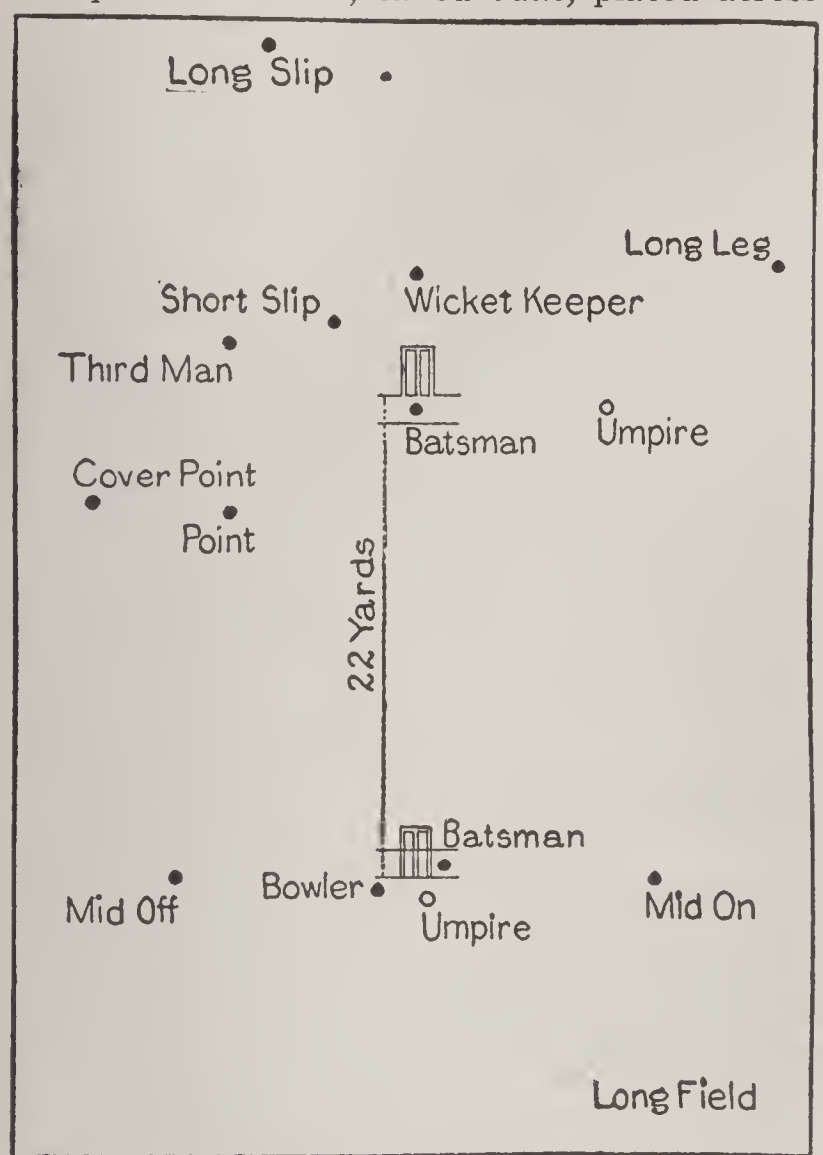


INTERESTING PARTS OF THE CRICKET
At left, wing of male cricket, much enlarged; (*a*) file, (*b*) scraper. At right: (*c*) File; (*d*) front leg, enlarged, showing ear at *d*.

antennae, longer than their own bodies, ordinarily appearing as in the illustration. During the day they remain in the ground, going forth at night for their plant food. Like grasshoppers, they leap quickly from place to place. The common, or true, crickets described above include those found throughout America in neglected fields and in old straw, and the house crickets of Europe, which are also common in Canada and in the Northeastern United States. In autumn they lay their eggs in pockets of the earth, to hatch in the spring. There are other species of crickets which differ in color and form, such as the *mole crickets,* with legs developed for burrowing, and *tree crickets,* whose habit of laying eggs in stems of raspberry and blackberry plants and in grape vines causes much damage.

CRICKET, the English national game, popular in Canada and all British possessions, and also played in some parts of the United States. It is of ancient origin, but its present name dates from about 1685. Although it requires much of the skill of baseball, it lacks for Americans many of the attractive features of that game, and as far as the American spectator is concerned it is lacking in interest and excitement. The game is played on greensward, as level as possible, by two teams, or

sides, consisting of eleven players each. At a distance of twenty-two yards apart two wickets are erected. These wickets consist of three stumps, twenty-seven inches in height, with two pieces of wood, called *bails,* placed across



THE CRICKET FIELD

the top. The stumps are placed sufficiently near each other to prevent the ball, which weighs five and one-fourth ounces, from passing between them.

How the Game Is Played. The two sides determine by lot which shall take the bat, and which shall field. The fielding sides are placed in positions most suitable for stopping or catching the ball when struck by a batsman. Two men with bats are posted, one to each wicket. The bat is thirty-six inches in length, twenty-two inches being taken up by the blade, which is four and one-half inches wide. The handle, about the thickness of the handle of a baseball bat, is fourteen inches long and made of pieces of cane spliced together. Two umpires are appointed, one standing near each wicket, to watch the game and give decisions when appealed to. Unlike baseball, the rules of cricket demand that no umpire shall call a man out or give any decision except in answer to a direct appeal. The bowler, or pitcher, as he might be called, takes the ball and bowls it against the wicket opposite him, in front of which stands a batsman. The object of the bowler is to make the ball hit the stumps, which the batsman defends by merely stopping the ball with his bat or by driving it into a distant part of the field.

The umpire, standing near the bowler, counts the balls delivered. When that number reaches six he calls, "over." Then the bowler at the other end takes the ball and the game proceeds in the same way. A batsman is "out" (1) if the bowler delivers a ball which passes his bat and strikes the wickets; (2) if he strikes a ball and it is caught on the fly; (3) if while he runs from wicket to wicket the ball is thrown to the base, as it were, and the stumps are disturbed before he reaches safety. He may also be put out if he leaves, for any purpose, a certain portion of ground in front of his wicket, marked off by white lines called *creases.* The creases also serve as a box for the bowler. If the ball is delivered from outside the crease the batting side may claim a penalty of one run. Runs are made by the batsmen, running backward and forward between the wickets after a ball has been struck. Also it is possible to score runs if the *wicket keeper,* who acts as the "catcher," standing behind the batter, fails to stop a ball that has passed the bat without disturbing the wicket. The wicket keeper protects his legs with pads and his hands with gloves. The batsmen do likewise, but those in the field, whether infield or outfield, must catch or stop the ball with their bare hands.

If a batsman places any part of his person in front of the wicket, allowing a ball which would otherwise have hit the stumps to hit him, he may be declared out. When all the batsmen of one side have been declared out, the opposing side takes the bat. A complete game consists of two innings for each side; whichever scores the largest number of runs is declared the victor. The game is so slowly played that it is seldom possible to complete the two innings in the time allotted; in this event the game is usually awarded to the highest score in one inning. In important matches such as those between counties, three days are allowed for a game to insure its completion.

Ethics of Cricket. The utmost ceremony is observed in the progress of the game. The opponents must be given fair play, and nothing whatever that could put a player off his game or embarrass him would be tolerated. Many appeals have been made to the leading

English cricket clubs to make alterations that would quicken the game and add to the spectators' interest. All such appeals have failed, because as one noted player remarked, "It would not then be cricket."

In Canada, cricket has suffered to a certain extent by the competition of baseball, which is growing in popularity in the Dominion, but there are many excellent clubs which produce teams that can hold their own with some of the best in England. The game of cricket has probably reached its greatest stage of perfection in Australia, where on account of the climate it may be played all the year. W.C.

Consult Spalding's *Cricket Guide,* for details of the game. Warner's *Cricket in Many Climes* and *Cricket Across the Seas* are interesting descriptive books.

CRIME, any offense against the peace, order or laws of a state. Such acts as burglary, arson, forgery, bribery, counterfeiting and murder are obviously injurious to the welfare of society. There are other crimes, however, which are not necessarily injurious; these are usually acts of omission rather than commission. For example, a factory owner may neglect to provide fire escapes on his building. His factory may burn while he is miles away, and the lives of employees may be lost. He actually did nothing to cause the disaster, yet the law may say that he was guilty of manslaughter. As a general rule a crime of omission is an act which would not be a crime if it were not especially declared so by a statute, whereas a crime of commission is obviously shocking and harmful.

The Essential Elements. The first essential element in any crime is the *criminal intent.* The law considers the intention of the person, on the basis of the evidence. An act of violence, even murder, is not a crime if it is committed in self-defense or as the result of an accident, or if it is committed by a public officer in the discharge of his duty. The law, too, regards certain classes of persons, such as young children, imbeciles and lunatics, as incapable of having criminal intentions. Under certain circumstances a crime committed under compulsion is considered justified. The phrase *criminal intent,* therefore, is somewhat misleading, for the courts really consider all the evidence and the obligation of an individual as well as his intention, in fixing the responsibility for a crime.

The definition of crime has varied greatly in different ages and in different countries. Even to-day there are many acts which are counted crimes in one land and not in others. In the early stages of society all wrongs against individuals were considered matters for private vengeance. The modern idea is that, since the state guarantees protection to all its citizens in the pursuit of life, liberty and happiness, any offense which threatens the security of all members of society becomes a matter for public concern, even if aimed against an obscure citizen. If the injury is not strictly anti-social in character—like trespass or false imprisonment, for instance—it is called *tort,* or private wrong, and is punishable by civil law (see TORT). There are some acts, such as assault and battery, which may be prosecuted both by the state under criminal law and by the individual under the law of torts.

Three classes of crimes are recognized in common law—*treason, felonies* and *misdemeanors*—although the present tendency is to class treason under felony. Felonies are crimes which are punishable by death or imprisonment in a state prison for more than one year. All other offenses are included under the head of misdemeanors and are punishable by fine only, by a short term of imprisonment in a workhouse or by both fine and imprisonment.

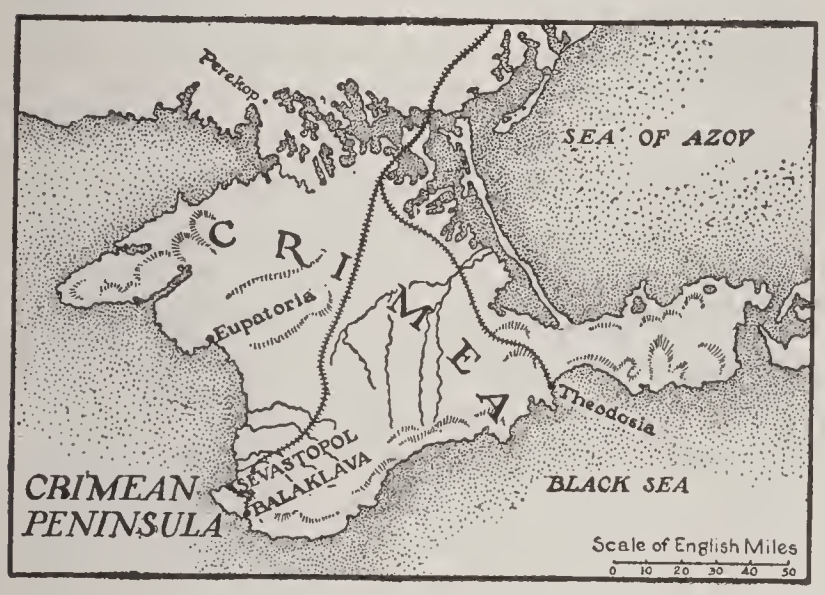
Criminal Law. Criminal law defines public wrongs, or crimes, and endeavors to mete out punishment according to the degree of guilt, just as civil law protects against private wrongs. The tendency of present-day criminal legislation is away from the old idea of retribution for wrong-doing and toward the newer idea of reforming the criminal and protecting society. During the past century there has been in all civilized countries a strong current in the direction of less severity in the infliction of punishment, particularly where the death penalty is concerned.

The criminal law has a certain elasticity by means of which the presiding judge is given considerable power of discretion in regard to the sentence. That is to say, the law prescribes a maximum and a minimum penalty, and upon the judge is placed the responsibility of deciding the degree of the prisoner's guilt. This naturally leads to a great lack of uniformity in the allotment of prison terms. There is strong agitation at present on the subject of the *indeterminate sentence,* and many of the more advanced states are passing new laws which aim at keeping the criminal under treatment in prison until he is pronounced fit for freedom. W.F.Z.

Related Subjects. The following articles in these volumes should be read in connection with the topic of crime. There will also be found in the index under LAW a number of closely-related articles:

Abduction	Fraud
Arson	Homicide
Assassination	Kidnapping
Assault and Battery	Larceny
Bigamy	Law
Blackmail	Manslaughter
Bribery	Mayhem
Burglary	Misdemeanor
Capital Punishment	Murder
Conspiracy	Peace, Breach of the
Counterfeiting	Piracy
Criminology	Procedure
Embezzlement	Robbery
Felony	Smuggling
Forgery	Treason

CRIMEA, *kri me' a,* a republic in Southern Russia, almost entirely surrounded by the Black Sea and the Sea of Azov. The neck of land joining it to the mainland, called the Isthmus of Perekop, is penetrated by a canal



seventy feet in width, so the Crimea has artificially become an island. It covers a total area of 15,060 square miles, and is therefore a little larger than the state of Vermont and not quite half the size of Nova Scotia. The land gradually rises from the sea in a series of steppes, the northern slopes of which yield splendid crops of grain and hardy fruits. In the south the valleys are luxuriant with vines, figs, olives, mulberries and other fruits, while the flowers rival in beauty those of the Mediterranean shores. Cattle, sheep and horses are reared in great numbers, and agriculture is in an advanced state, modern machinery being largely used.

The city of Sebastopol, or Sevastopol, carries on an extensive commerce, particularly in grains and fruits. The inhabitants are of mixed race; Turkish-speaking Tartars predominate, but there are a number of Greeks, Russians, Jews and Germans. The southern shore of the peninsula was before the War of the Nations a great seaside resort. All of Crimea is now an independent republic, but bolshevism overshadows the government (1922). Total population, 1920, 761,600.

Crimean War (1854-1856), the name given to a great struggle between Russia on the one hand and France, England, Sardinia and Turkey on the other, to resist Russian aggression in Europe. It had for years been the policy of England to maintain the Turkish Empire in its integrity rather than let Constantinople fall into the hands of a more progressive power. Russia had long cast its eyes on Turkey as the logical southern extension of its empire, to give it its long-desired Mediterranean outlet to the ocean on the south. Nicholas I, in accordance with the policy laid down by Catharine II, endeavored to proclaim a protectorate over Serbia, Bulgaria and Bosnia, with the avowed object also of occupying Constantinople. Such movements were held to endanger what is termed the "balance of power," and when Russia assumed the aggressive, Turkey, followed by England, France and Sardinia, declared war.

After a demonstration in the Baltic Sea, during which a French and English fleet captured Bomarsund, it became evident that the war must be decided in the Crimea. Allied troops landed, and after almost incredible hardships, caused by mismanagement, succeeded in completely defeating the Russians. The chief military events were the battles of the River Alma, of Balaklava and of Inkerman, and the capture of Sebastopol. It was in the Battle of Balaklava that the famous charge of the Light Brigade was made (see CHARGE OF THE LIGHT BRIGADE). The siege of Sebastopol, successfully concluded late in 1855, led to the conclusion of hostilities. By the terms of peace, arranged in Paris and signed on March 30, 1856, the integrity of the Turkish Empire was guaranteed, and the Russians renounced their ambitious policy. F.ST.A.

CRIMINOLOGY, *krim i nol' o ji,* a social science of recent origin which covers the subject of crime in all its bearings. It includes the evolution, causes and classification of crime; statistics showing how it varies in different countries, ages and seasons; the history, surroundings, habits and nature of individual criminals; means of preventing and lessening crime, and the administration of the machinery for dealing with criminals, represented by laws, courts, jails, prisons, workhouses, reform-

atories, industrial schools and the like. Thus it overlaps and merges with sociology, ethics, psychology, mental and physical hygiene, the study of heredity—in fact, the whole science of man.

Lombroso, the Pioneer. As a science criminology had its beginnings in 1876, when an Italian professor named Cesare Lombroso (1836-1909) published his famous work entitled *Criminal Man.* After close study of a large number of prisoners he announced his belief that a criminal is not a normal, civilized man, but belongs to a special type that reverts to the primitive savage state. To describe this class he originated the term *criminal by nature,* or *by instinct.* By way of proving his theory he made a detailed analysis of the physical characteristics of the criminals he had observed, and pointed out that certain abnormal features were common to all, whatever their nationality. Among these he cited the large, prominent jaw, retreating forehead, peculiarly-shaped head and ears, heavy hair, early wrinkles, scanty beard and frequent left-handedness.

Lombroso's work aroused much opposition, but it had the great merit of starting investigation. His opponents argued that if a man committed murder because of a barbarous nature for which he was not to blame, it would not be just to hold him to account; and that this view allowed no hope of reforming criminals through right prison training or of lessening crime by giving children the proper education and environment during the character-forming years.

Classes of Criminals. Later investigation and statistics have shown that only about ten per cent of the criminal class can be put in Lombroso's group of *born criminals.* The great majority come under the heads of *occasional criminals,* that is, those yielding to temptation or opportunity, and *professional criminals. Insane criminals* constitute a special group, on which borders also the large class of *mental defectives.* The least abnormal division is that of *criminals by passion,* which includes those whose criminal acts spring from some sudden blinding passion, such as anger, jealousy or avarice.

Some Causes of Crime. Want has been called "the mother of crime"; poverty is a large factor in the problem, particularly in cities, where the contrast with wealth is so sharply emphasized. Statistics show that crimes against property are most numerous in cold seasons and cold climates, and that they increase with "hard times" brought on by strikes, wars, business crises and the like. The largest percentage of crime is naturally among those without regular trade or employment. The last factor links itself logically with ignorance, another tremendously-important cause of crime. It is significant that the higher we go in the scale of education and occupation, the smaller the ratio of criminality becomes.

The French philosopher, La Bruyère, once wrote: "If poverty is the mother of crimes, want of sense is the father of them." In defying law and order, the criminal proves himself lacking in balance and ability to adapt himself to his social environment. Every insane or mentally defective individual is a potential criminal. A report of the Virginia State Board of Charities made in 1916 and based on five years of careful study, indicated feeble-mindedness in sixty per cent of the jail population of the state, and in sixty-eight per cent of all children passing through its juvenile courts and industrial schools.

Vicious environment is a fruitful source of criminality, and environment in turn is the outgrowth of existing social and economic conditions. However, it is the feeble-minded who are most susceptible to the influence of evil associates and surroundings. Drunkenness is responsible for a large proportion of crime; and this vice not only acts directly, but creates future criminals among the rising generation. It is a matter of record that ninety per cent of the backward children in schools come from homes where drunkenness is common.

Among other causes of crime may be mentioned crowded living conditions, political corruption, and sensational newspaper stories of crime, for notoriety appeals to the vain and abnormal nature of the criminal. It is also a proved fact that very hot weather and hot climates engender crimes, particularly those against the person, the extreme temperature having an exciting effect upon the emotions.

Protection Against Crime. The great principle which the science of criminology has developed is that the aim in the treatment of crime should be *help,* not punishment; the means, *education* and *hope,* not intimidation. Ruskin says, "Punishment is the last and worst instrument in the hands of the legislator for the prevention of crime." Z. R. Brockway, the man who made the Elmira (N. Y.) Reformatory a practical experimental laboratory for prison-reform methods, has declared, "The

history of criminal punishments, the world over, shows that the most crimes accompanied the greatest severity." Protection and prevention are the true safeguards. Society must protect itself against the possible crimes of the insane and the feeble-minded by caring for them in institutions.

Again, it must protect itself against the further crimes of convicted criminals by reforming the reformable through a many-sided prison training, covering mental development, moral suggestion, physical culture and practical instruction in some trade. But it protects itself primarily by going to the very root of the trouble and preventing crime by assuring every boy and girl an education which will train both body and mind; which will lay the foundations of good habits and sound character; and which will teach the child either a trade or a profession, so that he may become a self-supporting and self-respecting citizen. There is deep truth in the remark that "with every school we erect we tear down a prison."

Habit and Home Influence. Reformation is the ideal course with the convicted criminal. Formation of upright character and good habits is the groundwork which will make reformation unnecessary. If the right habits are once implanted they will form a wall blocking the way to evil; whereas, says a modern writer, "the slipshod habit, the lazy habit, the deceitful habit, early formed, often lead straight to the penitentiary." Mental and moral habits that affect the entire life of the man or woman are formed during the early years of childhood, when the mind is plastic. Thus the responsibility for laying the foundations of fine manhood and womanhood rests primarily with the home and the parents.

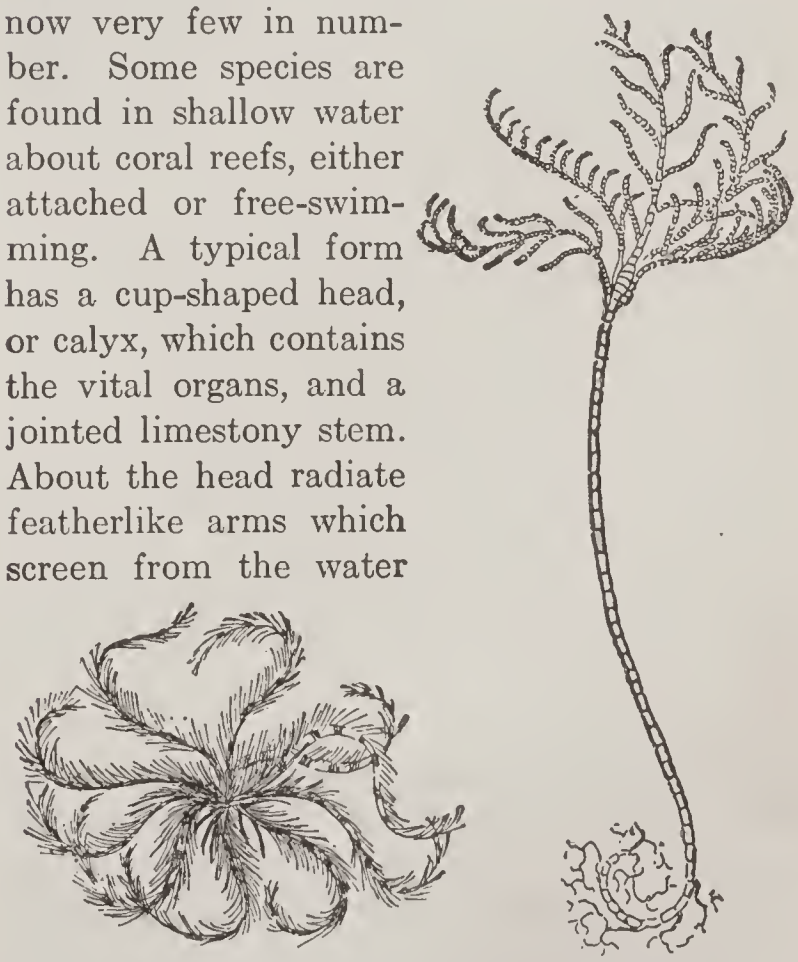
Modern Ideals and Reforms. The new methods of treating crime and criminals all take root in the principle that the purpose of separating the criminal from his fellows and taking away his liberty is to give him a chance to be "cured" and made fit to take his place in society. It is realized, however, that young prisoners are the most hopeful subjects for reformatory methods, and the reforming prison usually accepts none above a certain age. The greatest advances along reform lines have been made in the United States, chiefly in the Auburn State Prison, the Elmira Reformatory and at Sing Sing prison, all of which are in the state of New York.

The probation system for first offenders, the classification and segregation of prisoners, the indeterminate sentence, prison self-government, the honor system, parole, prison farms, juvenile courts, the "child rescue" and "big brother" movements, special colonies for the cure of habitual drunkards or drug victims and various related innovations are among the outstanding features of the great reform movement. The *indeterminate sentence* has been termed "a sentence to reformation," as it implies that the criminal shall not serve a definite term set by the court, but shall remain under prison treatment until he is pronounced no longer dangerous to society. This is similar to keeping a hospital patient under treatment until his health is restored. An indeterminate sentence law which became effective for New York City on January 1, 1916, affects annually an average of 10,000 persons admitted to, and an equal number discharged from, its penitentiary, workhouse and reformatory. E.A.R.

Related Subjects. The following articles in these volumes will be of interest to the reader who desires to learn more of the general topic of criminology:

Alcoholic Drinks
Crime
Ethics
Heredity
Indeterminate Sentence
Juvenile Court
Parole
Prison
Sociology

CRINOIDEA, *kri noi' de a,* or **SEA LILIES,** a group of strange and lovely sea animals, now very few in number. Some species are found in shallow water about coral reefs, either attached or free-swimming. A typical form has a cup-shaped head, or calyx, which contains the vital organs, and a jointed limestony stem. About the head radiate featherlike arms which screen from the water tiny shellfish and particles of plant life; this food is passed along grooves to the mouth. These arms make the animal look like a flower.



CRINOIDEA, OR SEA LILIES

Many carboniferous limestones are almost entirely made up of the brittle stems of these animals, the most famous in America being at Burlington, Ia., and Crawfordsville, Ind. See ECHINODERMS.

CRINOLINE, *krin'o lin,* from two Latin words, *crinis,* meaning *hair,* and *linum,* meaning *thread,* was the name applied to a cloth made on a linen woof, or foundation, with horsehair for threads. The resulting fabric was very stiff and wiry, and during three-fourths of the nineteenth century was used to make underskirts, to extend the enormously wide skirts of those days. Later a framework of steel-wire and tapes supplanted it, which was called by the same name.

A modern material of the same name is made of cotton gauze stiffened with glue. It is principally used by milliners in making hat frames.

CRIP'PLE CREEK, COLO., the greatest gold-producing camp in the world, is situated near the geographical center of the state, ten miles west and south of Pike's Peak. The elevation of the city is 9,800 feet. It is the county seat of Teller County, and the leading town in what is locally called "the District," a group of towns including Cripple Creek, Victor, Goldfield, Altman and others having a combined area of about eighty square miles. The District is about fifty miles southwest of Colorado Springs. It is on the Colorado Springs & Cripple Creek District (a branch of the Colorado & Southern), the Colorado Midland, a stub line which connects with the main line at Divide, thirty miles distant, and the Florence & Cripple Creek railways. The first-named road is also called the Cripple Creek Short Line and is a marvel of engineering skill, built through a country of rugged grandeur. The population of Cripple Creek in 1900 was 10,147; in 1920 it was 2,325. There are about 20,000 in the entire District. Practically every nationality is represented among the miners, who number more than 4,000 of the population.

The name *Cripple Creek* is said to have been suggested to an early settler by the lameness of an animal found feeding along the small stream in what was then a great cattle country. Gold was washed from this stream soon after 1860, but the very few outcroppings of rich ore were not discovered until 1891. In that year a settlement began with a "boom," and the next year (1892) Cripple Creek was incorporated as a city. Gold ore mined the first year was valued at $449; the value of the output in the next fifteen years exceeded $200,000,000. See GOLD. M.W.

CRITTENDEN COMPROMISE, *krit'en den kom'pro mize,* a measure submitted to Congress in 1860 by Senator John Crittenden, who hoped thereby to prevent the Southern states from seceding from the American Union. This compromise provided for the adoption of five amendments to the Constitution, as follows:

(1) That the right to hold slaves be recognized, and that slavery be permitted and protected in all the territory south of 36° 30′, and be prohibited north of that line. New states entering the Union should have the right to decide for themselves whether or not slavery was to prevail.

(2) That Congress should not have power to abolish slavery in those sections under its exclusive control which were within a slave-holding state.

(3) That Congress should have no power to abolish slavery in the District of Columbia so long as it existed in Maryland or Virginia; and that if slavery should ever be abolished in the District, the slave-owners should be compensated for their loss.

(4) That Congress should be prohibited from hindering the carrying of slaves from one state to another or to a territory where slavery was legal.

(5) That Congress might provide that the United States compensate slave-owners whose escaped slaves were rescued from pursuit. The Federal government in turn could recover damages from the county in which the rescue of a slave occurred.

The Compromise failed of passage.

CROATIA, *kro a'she a,* AND SLAVONIA, *sla vo'ni a,* formerly a province of Austria-Hungary, now a part of the new Jugo-Slavia, bounded on the north and east by the rivers

LOCATION MAP
Croatia and Slavonia, in black.

Danube and Drave, separated from Serbia and Bosnia by the River Save, and having the Adriatic Sea, Carniola and Istria on the west. Croatia is the western, and Slavonia the east-

ern, portion. The total area is 17,405 square miles. It is a mountainous region traversed by spurs of the Styrian and Julian Alps, which rise in places to about 4,000 feet above sea level. The northwestern region of Croatia is noted for its beautiful scenery, and is known as the "Croatian Switzerland." The climate is healthful, but the contrast between the hot and cold seasons is marked; in winter the temperature is frequently below zero and the snowfall is heavy.

The soil is fertile and produces good crops of wheat, maize, flax, hemp, tobacco, potatoes and fruit. Coal, iron, sulphur and copper are exported in small quantities. Manufacturing industries have not been well developed, but both Croatia and Slavonia produce silk and cotton fabrics. The province under the empire

AMERICAN CROCODILE

before 1919 was self-governing, control being administered by a governor who was responsible to the Diet, and to the ruling sovereign of Austria-Hungary. The inhabitants are chiefly Croats and Serbs, there being only a few Hungarians and Germans. The capital was Agram. Population of the province, 1920, 2,715,237. See JUGO-SLAVIA.

CROCKETT, *krock'et,* DAVID (1786-1836), one of the six great scouts of pioneer days in America, also a soldier and a politician, unlearned but shrewd and skilful. His maxim, "Be sure you are right, then go ahead," will live through the ages. He was born in Limestone, Tenn., and his training was that of the wild frontier, typical of the early nineteenth century. He ran away from home on his fourth day at school and did not learn his letters until he was eighteen years old. Under General Andrew Jackson he took part in the war against the Creek Indians. In 1826 he was elected to Congress and again in 1828 and 1832, and in Washington his strange manner and dress attracted considerable attention. Upon retiring from Congress he joined the Texans in their war for independence. At the Alamo in 1836 he was one of the six survivors of the siege who upon their surrender to General Santa Anna were massacred by the Mexicans. The brave defense of this building is related more fully under the title ALAMO.

Several crudely witty books are said to have been written by Crockett, *A Narrative of the Life of David Crockett, A Tour to the North and Down East,* and *Exploits and Adventures in Texas.*

CROCODILE, *krock'o dile,* a large, flesh-eating (carnivorous) water animal related to the alligator and regarded as the most highly developed of reptiles. True crocodiles inhabit the warmer parts of the eastern hemisphere, but three species are found in North and South

GANGES CROCODILE

America, being especially abundant in Mexico and Central America; one species lives as far north as Florida.

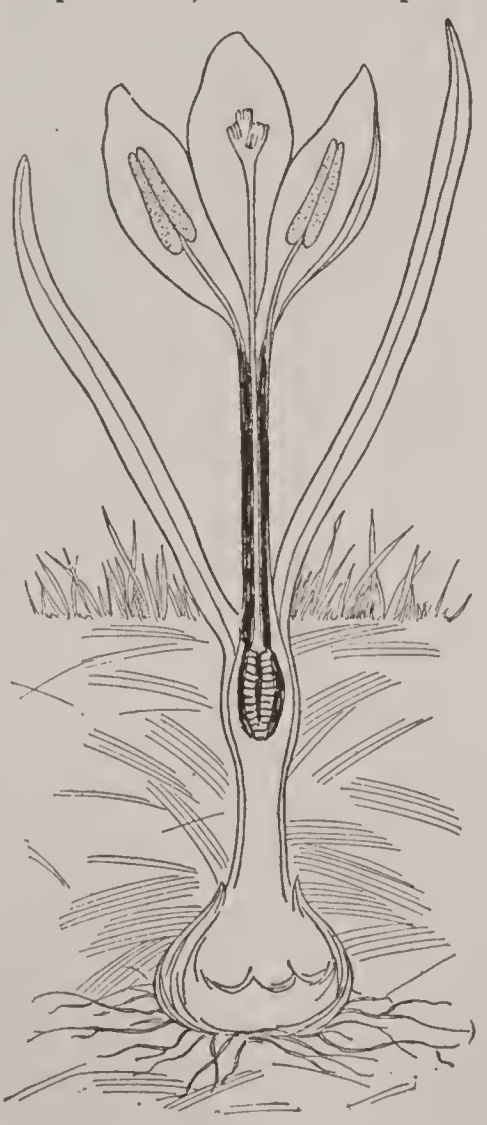
The head of a crocodile is more narrow than that of an alligator, and the snout is pointed instead of rounded. Other points of distinction are its olive color with blackish markings, the more vertically-flattened tail, and its longer and more pointed teeth, the lower fourth tooth being enlarged and fitted into a groove at the side of the upper jaw. As it is only about two-thirds as heavy as an alligator, the crocodile is much more agile. The average length of this reptile is about ten feet. It has webbed feet, and ears and a snout fitted for life in the water. Like the alligator, it lives on fish, birds and mammals, and species in India and Africa are feared because of their fondness for human flesh. There the short, loud bark or croak of the crocodile fills natives with terror. The crocodile of India,

which infests rivers like the Ganges, differs slightly in appearance from the American species, its snout being narrower.

Crocodiles are caught in various ways. A popular method is to place crossed spiked sticks in bait. When the animal swallows the bait the act holds its jaws shut, and the spikes stick tight so the animal can be pulled out of the water and roped. Hunters also creep up on sleeping crocodiles, beat them insensible with heavy clubs and so secure their prey. The horny, plated armor of the animal is impenetrable by bullet or spear, but the skin underneath is tender. The crocodile can be shot only through the eye. The eggs of the crocodiles, buried in sand or mud, are left to be hatched by the sun's heat alone. Crocodiles of the Nile were worshiped by Egyptians in olden times and their bodies were preserved almost as carefully as those of human beings. Crocodile skin and fat are articles of considerable commercial importance, the musk glands are taken for perfume, and some prize crocodile eggs as food. The tough skin is made into a high grade leather, and is used especially in the manufacture of traveling bags.

The fanciful tale which ancient travelers told about crocodiles weeping over their victims gave rise to the term *crocodile tears,* meaning hypocritical tears. See Alligator; Gavial.

CROCUS, *kro'cus,* one of the first flowers to push through the snow in gardens to announce the approach of spring. It was the early spring flower of the Greeks; Homer says, "The flaming crocus made the mountains glow." Most species are natives of Southern Europe and Asia Minor, but are now cultivated in gardens everywhere. Up from the corm shoot the grasslike leaves (see Corm). And at the same time the almost stemless funnel-shaped flowers gladden the eye with their purples, lilacs, mauves, yellows and whites. Some are fragrant, and all have six nearly equal parts, with three stamens. Planted on a lawn, with their soft background of green, crocuses are especially attractive. They are easily cultivated, will grow from year to year, and are inexpensive. The *yellow crocus,* or *cloth of gold,* is a favorite species.



CROSS SECTION OF CROCUS

Fair-handed Spring unbosoms every grace;
Throws out the snowdrop and the crocus first.
—Thomson: *Seasons.*

Crocus is Latin for *saffron.* From the stamens of the autumn-flowering species of crocus is obtained the saffron used as a stimulant in medicine, in cakes and candies for coloring, and as a dye. Most of the saffron of commerce comes from Persia, the autumn-flowering crocus being rarely cultivated elsewhere; aniline colors, however, are now taking its place.

In mythology a boy who loved the nymph Smilax was changed into a crocus blossom.

CROESUS, *kre'sus,* one of the mightiest and richest of kings, the last to reign over Lydia, from 560 to 546 B.C. "Rich as Croesus" is a familiar term used to denote fabulous wealth. Croesus obtained his riches from mining gold and from levies upon the people. Noted for his reverence for the oracle of Delphi, he gave enormous presents to it. Finally he declared war on Persia, the oracle having assured him that if he crossed the Halys River he would destroy a great empire. This prophecy proved true, but the destroyed empire proved to be his own, for he was utterly defeated, and Sardis, his capital, was taken.

CROM'WELL, Oliver (1599-1658), an "uncrowned king" of England, whose official title upon his rise to power was Lord Protector of the Commonwealth of England, Scotland and Ireland. Few men have ever inspired more heartfelt love and reverence, and at the same time more heartfelt fear and hatred than did he, and historians have not ceased to dispute about his character. Certain things about him, however, cannot be questioned—that he was a man of iron will, and that in everything he did he was true to a high moral purpose. He never went into battle without a prayer on his lips, and he so bore himself that one who knew him intimately said, "A larger soul, I think, hath seldom dwelt in a house of clay."

Cromwell was born April 25, 1599, at Huntingdon, of a family which had been high in favor with the English kings, but beyond the fact that he studied at Sidney Sussex College,

Cambridge, little is known of his early life. In 1620 he married Elizabeth Bourchier, a woman of some wealth, and after that date his movements are better known. Elected to Parliament in 1628, he showed no signs of his future greatness, but he delivered one speech which made it clear that when the inevitable religious conflict came he would be on the side of the Puritans. Indeed, his love for religious toleration was so intense that at one time he thought seriously of emigrating to America to join the Puritan colony there. In 1640 came the beginning of his rise to prominence, for in that year he was elected to what became known as the Short Parliament and to the Long Parliament which almost immediately succeeded it.

OLIVER CROMWELL

It must not be assumed, however, that Cromwell at once took a leading part in that body. He spoke on all important topics, especially favoring the attempt to abolish the episcopacy, but he was content to remain subordinate. But when the Civil War broke out in 1642 he became the dominant force, for this man who "never saw an army till he was forty" was a born military genius. He trained his cavalry till he had at his command the best-drilled regiments in England, and in all the battles in which he was at the head of the Parliamentary forces the royalists were defeated, for he never lost a battle. When, in 1645, the Self-Denying Ordinance was passed, excluding members of Parliament from military command, an exception was made in favor of Cromwell, who continued to lead his "Ironsides." Under him served men whom he had picked for their religious enthusiasm no less than for their military forcefulness.

When the break came between the two factions of the Puritans, the Presbyterians and the Independents, Cromwell identified himself with the latter and strengthened his hold on the army, while the Presbyterians ruled in Parliament. Fearing that the latter sect would actually restore to power the tyrannical Charles I, to whom they had begun to make advances, Cromwell finally agreed to the execution of the king, and was one of the signers of the death warrant. In Ireland and in Scotland strong royalist parties yet remained, but Cromwell, by his stern methods and his victorious battles, succeeded by 1650 in putting down the last active movements in behalf of the royal house.

The Long Parliament, having been in session for twelve years, refused to disband, nor would it submit itself to Cromwell, so he disbanded it in 1652 with the aid of his troops, and summoned a new body. This showed itself capable of accomplishing nothing, and when it dissolved of its own accord the officers of the army took matters into their hands, drew up the so-called Instrument of Government, and made Cromwell Lord Protector. A Parliament was assembled, but proved to have no object beyond making itself perpetual, and the Lord Protector therefore dissolved it, relying on the army for support in his wise and tolerant schemes. The only other Parliament which he ever called (1656) offered him the title of king, and it seems that he refused it only because he dared not accept.

The greatest thing that Cromwell accomplished for England was the restoration of its world influence by means of a wise foreign policy. In the years just before the establishment of the Commonwealth it had almost ceased to be looked upon as one of the great powers, but at his death it stood fully as high as it had ever done before. It might be expected that so determined an opponent of absolutism would have banished all trace of it from his ruling and have left on the constitutional history of his country a lasting mark, but such was not the case. In reality, he governed almost as absolutely as did Charles I, but one difference must not be forgotten: Cromwell had no wish to be tyrannical, but was obliged by the very troubled character of the times to adopt stern measures. Charles I was absolute with his own good in view; Cromwell, only in the interests of his country.

He died in 1658, and for two years his son Richard endeavored to continue his father's policy, but he was unsuccessful, and the people welcomed the royal line in the person of Charles II, in 1660. A.MC C.

Consult Roosevelt's *Oliver Cromwell;* Marshall's *Story of Oliver Cromwell;* Firth's *Oliver Cromwell and the Rule of the Puritans in England.*

Related Subjects. The following articles in

these volumes will give further information as to the life and times of Cromwell:

Cavaliers	Long Parliament
Charles, subheads	Marston Moor
Charles I and	Naseby, Battle of
Charles II	Puritans
Commonwealth of	Restoration, The
England	Roundheads
England	Rump Parliament
Subtitle *History*	Self-Denying Ordinance

CROMWELL, THOMAS, Earl of Essex (about 1490-1540), an English statesman who rose to power and influence through his willingness to carry out the wholly selfish plans of Henry VIII. Early in his career he gained the friendship of Cardinal Wolsey (see WOLSEY, THOMAS), who encouraged him to enter Parliament; there he successfully defended his patron against a bill of impeachment. Henry VIII, observing his unusual ability, made him his private secretary, and later conferred on him a succession of offices, appointing him Chancellor of the Exchequer, Lord of the Privy Seal and Lord Chamberlain; finally, in 1540, he was created Earl of Essex.

His submission to the king gave him undisputed authority in all the departments of administration, and he carried out Henry's orders for suppressing the monasteries so vigorously that he was nicknamed the "Hammer of the Monks." Cromwell at last fell a victim to the whims of his royal master, for Henry, conceiving a dislike for his third wife, Anne of Cleves, took revenge on the Earl, who had promoted the marriage, and allowed him to be tried for treason. Thus, in the same year that he received his title of nobility and reached the summit of his honors, he was beheaded.

See HENRY, subhead *Henry VIII,* and references there found to other articles in these volumes.

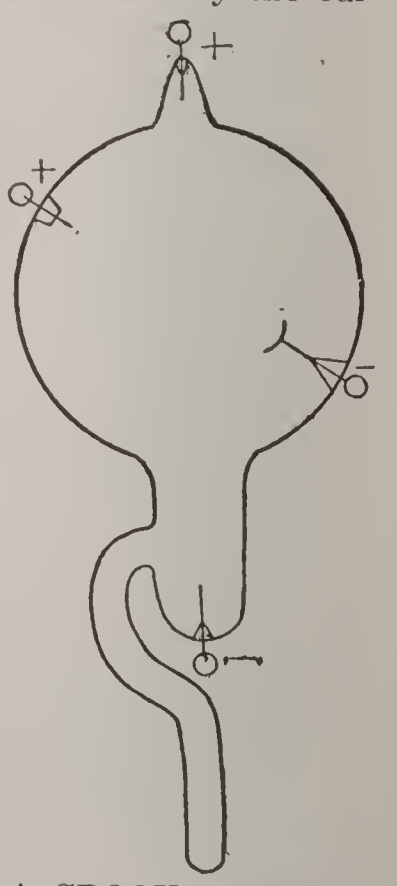
CROOKES, *krooks,* SIR WILLIAM (1832-1919), a distinguished English scientist whose chemical and electrical discoveries and inventions have given him a permanent place among the great men in the field of science. He was born in London, and after completing his education at the Royal College of Chemistry became superintendent of the department of meteorology at Radcliffe Observatory, Oxford University. In 1855 he accepted the professorship of chemistry at Chester Training College. In 1859 he founded the *Chemical News,* and assumed its editorship.

Professor Crookes' experiments in electricity led to his invention of the Crookes tubes (which see), widely used in the production of X-rays. He was also the discoverer of the element thallium, and of the sodium amalgam process of separating gold and silver from their ores (see AMALGAM), and he devised the radiometer (which see). He was regarded as the highest authority on the application of the laws of chemistry to the industrial arts, and on matters of sanitation. He was knighted in 1897, was awarded the Nobel prize for chemistry in 1907, served as foreign secretary of the Royal Society from 1908 to 1912, and in 1914 was elected president of that organization.

SIR WILLIAM CROOKES

The writings of Professor Crookes, which are numerous, include *A Practical Handbook of Dyeing and Calico Printing, Select Methods of Chemical Analysis* and *Diamonds.*

CROOKES TUBES. Electricity will pass through a vacuum more rapidly than through the air. If the air be gradually exhausted from a closed glass vessel through which an electric current is passing, the spark caused by the current gradually changes to wavy lines and then to a brush of light. When the vacuum is nearly complete the entire vessel is filled with light. Tubes or other glass vessels from which the air has been exhausted and into the opposite ends of which platinum wires have been sealed for electrodes are known as Crookes tubes. The effect can be secured by attaching the electrodes to the opposite poles of an electric machine or to an induction coil.



A CROOKES TUBE

Smaller tubes containing different gases and used as electric toys are known as *Geissler's tubes* (which see). Crookes tubes are used in the construction of apparatus for the produc-

tion of X-rays. See ROENTGEN RAYS; ELECTRODE.

CROQUET, *kro ka',* a game requiring, like billiards, firmness of wrist and a true eye, played by young and old, indoors and out. Indoors a long table, with a raised edge and covered with a smooth cloth, is used. The outdoor game, however, is the more popular. A well-rolled turf or a smooth spot of clay forty-five by ninety feet is best, but the game can be played enjoyably on any reasonably level lawn.

A croquet set consists of eight balls, each with a painted colored band to match a similarly-marked mallet, two stakes, one banded to match the colors on balls and mallets, the other with one band, and ten wire arches, or *wickets.* The wickets are placed as shown in the diagram; sometimes only nine are used, in which case only one is placed in the center of the field. Two or more persons play. If two play, each sometimes uses two balls. When four play each has but one ball, but when playing partners those who play together have many opportunities to help each other to favorable positions.

The object of the game is to start the ball from one stake, make the circuit through all arches on one side, including a middle arch, hit the other stake, then pass through the arches on the other side, back to the starting stake (see diagram). The player or side first completing the circuit wins the game. Each player, according to the usual rules, is allowed to strike his ball but once, aiming for a wicket. If the ball passes through the wicket he may play again. If his ball strikes an opponent's ball, he may place his ball beside the opponent's and so strike his own that the other is sent out of position, and his own to a more favorable spot. He has the alternative privilege of placing his ball a short distance from his opponent's and taking two strokes. Skilful players often make the entire circuit to the home stake without giving their opponents an opportunity to start.

There are special rules for emergencies, and a number of technical terms. As the game is usually played, a player who hits an opponent's ball may not do so again until he has sent his ball through an arch. Until he succeeds in so doing he is said to be *dead on* that particular player. A *rover* is a ball which has completed the circuit but has not touched the home stake. Such a ball may play on every other ball in the field, and its owner may hit his opponents' balls as often as he chooses, without his ball being considered *dead,* except that he cannot hit the same ball twice in one turn.

The game of croquet is thought to have originated from the old French game *pail mail,* which gave its name to that famous street in London, Pall Mall. A scientific form of croquet, called *roque,* is rapidly gaining popularity in America and England, a number of national and international roque societies having been organized. W.C.

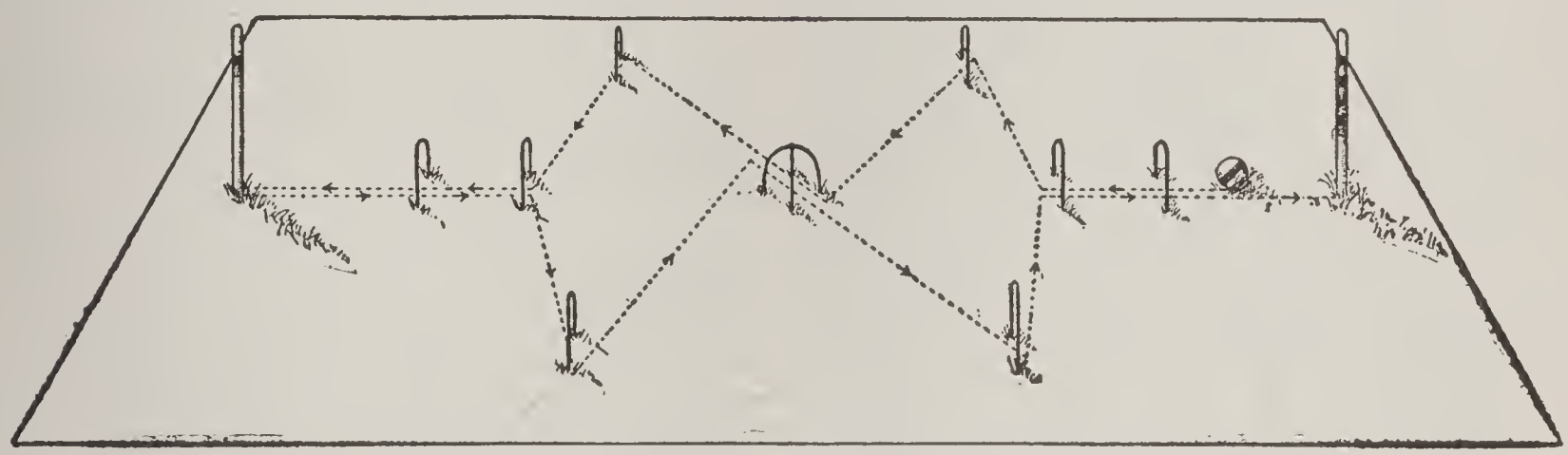


DIAGRAM OF A CROQUET FIELD

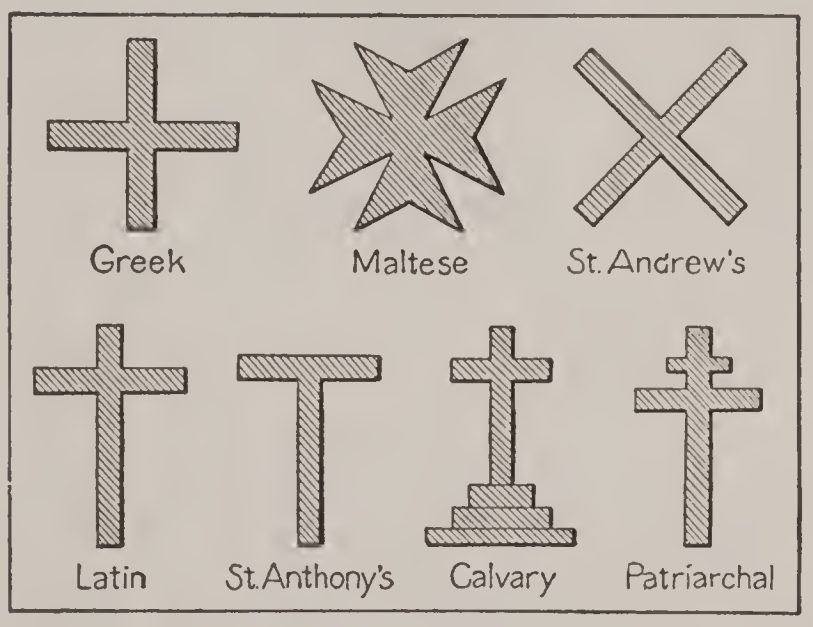
CROSBY, *krawz'bi,* FANNY (1820-1915), the childhood name of FRANCES JANE VAN ALSTYNE, a blind hymn-writer whose songs have been a comfort to millions of people. She was born at Southeast, New York, and when only six weeks old lost her sight through the application of too hot a poultice to her eyes. At the age of fifteen she entered the New York Institution for the Blind, where she spent twelve years as a pupil. Her teachers noticed her wonderful gift for writing poetry and on many occasions selected her to address distinguished guests. These addresses were always in verse form.

In 1847 she became a teacher in the same institution in which she had received her education. After eleven years in that position she married Alexander Van Alstyne, a blind musician, who was then a pupil in the school. In 1864 she began writing hymns, and no other person since the days of Charles Wesley and

Isaac Watts has made as large a contribution to the gospel song-book, for at her death over 6,000 hymns bore her signature. Her favorite song, *Safe in the Arms of Jesus,* was written when she was suddenly inspired with the sense of security in trusting in God; *Rescue the Perishing* was inspired by another event. Such songs from her pen as the following are known the world over: *Pass Me Not, Blessed Assurance* and *What a Gathering.* The chorus of *Close to Thee* typifies the faith of her whole life:

Close to Thee, close to Thee;
All along my pilgrim journey,
Saviour let me walk with Thee.

CROSS, a structure consisting of an upright and a crosspiece attached to it, which, since the crucifixion of Christ, has been a sacred symbol



VARIOUS FORMS OF CROSSES

throughout the Christian world. Literature, especially hymnology, contains innumerable references to the cross as a religious emblem. Spenser alludes to its use as a symbol in Christian warfare in the following passage from the *Faerie Queene*:

And on his breast a bloody cross he bore
The dear remembrance of his dying Lord,
For whose sweet sake that glorious badge he wore.

The cross as a symbol of Christianity, as distinguished from the moon, or crescent, the emblem of Mohammedanism, is beautifully expressed in Shelley's lines:

The moon of Mahomet
Arose and it shall set;
While, blazoned as on heaven's immortal noon
The cross leads generations on.

In ancient times slaves and criminals of the lowest class were frequently tied or nailed to crosses and left to perish of pain or starvation. Such a cross was often formed merely by fastening a piece of wood to a tree or a post. Though the death of Christ gave the cross a new meaning, it was an object of religious veneration among savage tribes long before the Christian Era.

Various forms of the cross are used in art. The Latin cross, supposed to be the one on which Christ died, consists of a long upright beam and a piece fastened to it at right angles below the summit. The Greek cross has four arms of nearly equal length, this being the form of the cross of Saint George, the national ensign of the English before the union with Scotland.

The cross of Saint Andrew, consisting of two beams crossing one another obliquely, is traditionally the form of cross on which Saint Andrew died a martyr. It is now blended with the cross of Saint George in the British ensign, the Union Jack (see FLAG). A form used by the orders of knights in the days of chivalry was the Maltese cross, having eight pointed ends.

CROSS, MARY ANN or MARIAN. See ELIOT, GEORGE.

CROSS'BILL, a gentle, friendly bird of the finch family, whose peculiarly-crossed bill gave it its name and has called forth various legends. The fanciful tale that the bird tried to draw the nails from the hands of Christ on the cross, so crossing its bill and staining its feathers with blood, has been put into verse by Longfellow in *The Legend of the Crossbill.*

THE CROSSBILL

The common male crossbill is colored brick or Indian red, with wings and tail of brown, and is about the size of an English sparrow. The plumage of the female is a slightly-mot-

tled, dull yellow, with the under parts of white. This bird is a winter visitor in America from Pennsylvania to Northern Canada, sometimes staying from November until April. It feeds on the seeds of pine cones, fruits, berries and buds of trees, and is said to be very fond of salt. It builds its nest in the upper half of an evergreen, where it lays its three or four tiny, beautiful, pale-greenish, purple or lilac-spotted eggs. A white-winged species of crossbill exists, but is quite rare.

CROSS-FERTILIZA'TION, the work of water, wind, insects and birds in making plants produce fertile seeds. Those agencies bring the pollen from the stamens of one plant to the pistils of another, thus bringing together the characteristics and habits of two distinct individuals and causing seeds which will either almost exactly reproduce their kind, or in some cases will produce better, stronger, more fruitful plants. In *self-fertilization* the pollen of a plant falls upon its own pistil and produces seeds holding just the same faults or virtues that the parent plant possesses.

Mother Nature has devised many ways to make sure of this union of traits for the benefit of future generations of plants. For instance, in some plants, like the geranium, the pistils of one flower are not ready to receive pollen when its own pollen is ripe. Others, like the primrose, have shorter stamens than pistils, so its own pollen cannot reach its stigma. And in some cases, like the willow, one plant bears the male blossoms, another the female. So the winds, the insects and the birds are Nature's pollen carriers.

And once again Mother Nature has carefully planned. Those plants which depend on the wind, because their blossoms are brown or greenish, inconspicuous and not attractive to insects, produce large quantities of light, dry pollen, for much of it will be wasted. And the flowers which hold stores of honey, and advertise with scents and colors to insects and birds, have many ways to make doubly sure their pollen will be reached and carried away or that their pistils will receive pollen. The orchid carries its pollen in little sticky bundles, and the flower is so constructed that in order to reach the store of nectar the bird or insect must reach so far in that a bundle of pollen will glue itself to its head, and when it goes to the next flower the pollen will be brushed on the receptive pistil as the insect pushes in for its honey. The pollen of the milkweed is found in two little bags connected by a straplike part; the feet of the bee get tangled, and so it carries away both bags of pollen. The mints are provided with levers which thrust the pistil forward on the pollen-dusted insect.

In a general sense, the term *crossing,* related to cross-fertilization, is also applied in cases of animals and the human race. A limited amount of crossing in similar environments and under similar conditions among species not too closely related produces improved offspring. See BURBANK, LUTHER; BOTANY. L.B.

CROTH'ERS, THOMAS WILSON (1850-), a Canadian barrister and statesman who became Dominion Minister of Labor in 1911. After graduating from Victoria College he taught school for four years. He then studied law and after 1880 practiced his profession at Saint Thomas, Ont. Until 1908, though he was always interested in politics, he had taken no active part in public affairs, except in 1879, when he was an unsuccessful candidate for the Ontario legislature. He was elected to the House of Commons at Ottawa in 1908, and three years later, when the Conservative Ministry headed by Sir Robert Borden was formed, assumed the charge of the Department of Labor.

CRO'TON AQUEDUCT. See AQUEDUCT.

CROUP, *kroop,* a word commonly understood to mean a disease of babyhood or childhood, characterized by hoarse cough and periods of difficulty in getting the breath. There are two forms of the disease—*spasmodic,* or *false,* croup, and *membranous* croup. The latter is sometimes confused with diphtheria (which see), but a competent physician can correctly diagnose the ailment without difficulty. False croup often attacks feeble or ill-fed children who have suffered exposure to cold and wet or are subject to digestive disturbances. The attacks come on suddenly, and the child awakens coughing hoarsely and breathing heavily or gasping. The face becomes red or purplish, and the patient seems on the verge of suffocation. Paroxysms may last from half an hour to five or six hours, and may occur on several nights in succession. A tea-kettle of hot water placed under a sheet thrown over the child's bed permits inhalation of warm, moist air, a remedy generally advised by physicians. The child should also be given frequent drinks of warm milk, and vomiting should be induced by doses of syrup of ipecac, a half-teaspoonful being given every fifteen minutes as long as is necessary.

Membranous croup, an infection of the larynx, caused by the bacillus which produces diphtheria, is both dangerous and contagious. The symptoms of false croup are present, but they become steadily more severe, and the child usually is drowsy for a few hours before he begins to cough. Pieces of membrane rise with the cough, and in the last stages coma and convulsions are liable to occur. Relief from suffocation sometimes is afforded by inserting a metal or hard rubber tube into the windpipe below the larynx, through a cut made in the neck, and another remedy consists in passing a specially-devised tube down the throat between the vocal chords. These are not, however, curative measures. For checking the disease the administration of antitoxin (which see) is the only sure remedy. W.A.E.

CROW, a family of 200 species of large, black birds found in nearly all parts of the world.

Even the blackest of them all, the crow,
Renders good service as your man-at-arms,
Crushing the beetle in his coat of mail,
And crying havoc on the slug and snail.
—LONGFELLOW: *Tales of a Wayside Inn.*

The characteristic hue of these birds has given rise to the old familiar expression "as black as a crow." This family includes the common crows, jays, ravens, magpies, fish crows, whisky jacks or Canada jays, rooks and jackdaws. History and literature, including sacred writings, contain frequent and striking references to its various members. Through this source of information few birds are better known.

The clever, fearless American crow, also called *corn thief,* is typical of this large family and is commonly seen in meadows, orchards and woods throughout the United States and most of Canada. It usually winters in the United States. It is eighteen or nineteen inches long and has glossy black plumage, with violet and greenish reflections. Its bill is strong, compressed toward the points and covered with bristly feathers at the base. When spread, the wings appear saw-toothed and are almost as long as the tail. The feet are stout and especially adapted for walking. The sexes are about alike in appearance. These birds are intelligent to a remarkable degree, and they are easily domesticated. Occasionally one becomes a family pet, but it will steal and fly away with any bright object, so it is sure to be more or less of a pest.

The crow has earned an unfavorable name among farmers because of its pernicious habit of pulling up sprouting corn in its search for cutworms, white grubs and other forms of insect life, and because of its liking for poultry and eggs. It also eats the growing corn. In *Farmers' Bulletin 513,* issued by the United States Department of Agriculture, the suggestion is made that the seed grain be coated with coal tar to prevent damage to the growing corn. The crow so dislikes the odor of this substance that it will usually pass by the corn hills in which seed so treated has been planted. It is also pointed out that losses of poultry and eggs may be prevented by proper housing and the use of wire netting. One of the chief crimes with which the crow is charged is its destruction of beneficial wild birds and their eggs. Accordingly, communities in which it has become a nuisance are justified in reducing its numbers. On the other hand, the crow renders excellent service to the farmer by feeding on insect pests; its work in this connection has been praised by Longfellow in his *Birds of Killingworth* (from *Tales of a Wayside Inn*).

Crows are devoted to their mates. Their coarse nests are built along hedges or high in tree tops. There four to six or seven pale bluish-green or nearly white eggs are laid.

The *fish crow,* a greater enemy of birds than the common crow, is abundant on the Atlantic coast from the Gulf of Mexico to Southern New England and New York. It does not touch the crops, however, shellfish and other sea food constituting much of its diet. It is more slender than the common crow, and another important difference between the two is its more feminine call—*car-r car-r*—like that of the young of the more common species. The *Clark crow,* which nests in the high pines of the Rocky Mountains, is pure white with a little black on wings and tail. The *hooded crow* of India and Ceylon is a small species of this bold, thievish family. Crows usually fly in a straight course, so the expression, "as the crow flies," in judging distances means in a straight line from one point to another. Crows are said to live to be about a hundred years old. J.B.

CROW, or **CROWS,** a tribe of Indians related to the Sioux. They formerly occupied the valley of the Big Horn River and later the country about the headwaters of the Yellowstone in Northwestern United States. They were skilful horsemen, and continually at war with surrounding tribes. The women excelled in the manufacture of ornamented wearing apparel. They now number about 1,800, and live on a reservation in Montana. See INDIANS, AMERICAN.

CROW BLACKBIRD, or **PURPLE GRACKLE,** *grack''l,* also called *maize thief* and *keel-tailed grackle,* is a handsome blackbird with violet, blue, copper and green tints, and is especially conspicuous for the bright yellow iris of its eye. Its range is in Eastern North America from the Gulf of Mexico into Southern Canada. It feeds chiefly on grasshoppers and the eggs and young of birds, only occasionally attacking crops. It is about a foot long, with a tail, longer than the wings, which it uses for steering. Its call is a wheezy whistle. In the warmer states it remains all the year, but migrates in great flocks from the colder regions of the north.

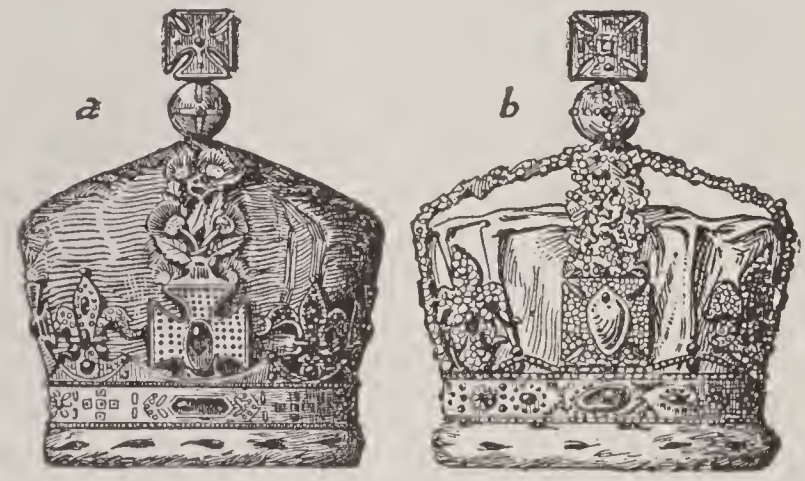
The *bronze grackle,* found west of the Alleghany Mountains, also from Connecticut to Labrador, is a similar bird, differing chiefly in its more brownish tint and louder call. In *My Garden Acquaintances* Lowell gives a very pleasing picture of grackles.

CROWDER, ENOCH HERBERT (1859-), an American army officer who as provost-marshal was charged with the responsibility of the operation of the selective draft law in 1917, after the United States entered the War of the Nations (see page 6174). He was born in Missouri, saw service in the Spanish-American War as lieutenant-colonel of volunteer infantry, and at its close joined the regular army. In 1901 he was raised to the grade of brigadier-general and was sent to the Philippine Islands, where he remained three years. Thereafter he was military observer in Manchuria with the Japanese army, after which he was detailed to Cuba during the second American occupation.

In 1911 Crowder was sent as envoy extraordinary and minister plenipotentiary on a special mission to Chile. When not on duty he makes his home in Kansas City, but since 1912 has seldom been absent from the War Department.

CROWN, an English silver coin of the value of five shillings, or one-fourth of a pound sterling. This is equivalent to about $1.22 in United States or Canadian money. It bears a likeness of the reigning sovereign on one side and a crown on the other. The name was probably first given to this particular coin in the reign of Charles I, a special issue then being known as the Oxford Crown. In the time of Henry VIII a coin of similar value was issued in gold, but this coinage was replaced by silver in the reign of Edward VI. The crown, as now in circulation, weighs 436.3636 troy grains, of which .925 is pure silver. It is heavy and cumbersome and is often mistaken for a double florin, or four-shilling piece, which it closely resembles. The crown is also the monetary unit of Austria-Hungary, Denmark, Norway and Sweden. See COINS, FOREIGN, table of values, page 1468.

CROWN, an ornament designed for state occasions and worn on the head of a monarch



ENGLISH CROWNS
(*a*) Worn by Queen Victoria; (*b*) the crown of King George V.

as an emblem of sovereignty. The custom was borrowed probably from the Romans, who decorated their popular heroes with wreaths and garlands, which gradually were made of metal, usually gold. The modern crown is in fact an evolution of the jeweled head dress of the Assyrian and Egyptian monarchs and the diadem of the Roman emperors. From the reign of Constantine (306-337) the diadem was regarded as the emblem of imperial power. It gradually received additional ornaments until the modern elaborate crown was evolved. The British royal crown is a gold circlet, ornamented with diamonds, pearls and other precious stones, heightened by crosses and fleur de lis, from which rise four arches surmounted by a jeweled gold cross. Some of the jewels in the crown of King George of England are of great historic interest and are regarded as almost priceless. The intrinsic value of crown and jewels has been estimated at about $1,000,000. A few of the crowns of Indian princes contain jewels whose value seems almost fabulous to Western peoples.

Iron Crown of Lombardy, a name given to the crown worn by the Lombard kings and the emperors of Germany when they became kings of Lombardy. It was not precisely an iron crown, but was made of gold, with an iron band which tradition says was beaten from a nail of the Cross on which Christ was crucified. When it was made is not known, but previous to the twelfth century it was called the Golden Crown. The most notable monarchs who wore this crown were Charlemagne, Charles V and Napoleon I. It is now preserved in the Church of Saint John the Baptist at Monza, Italy.

CROWN POINT, a township in Essex County, N. Y., important for its Revolutionary War associations. It was settled by the French in 1731 and was one of the chief frontier posts during the struggle for colonial possessions. Along the natural lines of travel and communication between Canada and the colonies of England, Crown Point, a little fortress on Lake Champlain, was a strategic point, for here the lake narrows to the width of a river, and so a few small cannon could command the passage. This was called *Scalp Point* by the French, *Crown Point* by the English. At the outbreak of the Revolutionary War, while Arnold and Ethan Allen took Ticonderoga, a body of "Green Mountain Boys" under command of Seth Warner captured Crown Point, on May 11, 1775, with 200 cannon and a quantity of ammunition. A slope of the embankment with part of the ruins of the barracks is still standing.

Crown Point is 110 miles northeast of Albany and ten miles from Ticonderoga, on the west shore of Lake Champlain and on the Delaware & Hudson Railroad. Since the mining of iron ore has been abandoned, the town is dependent on its agricultural resources. Population in 1910, 2,200. A.E.R.

CRUELTY TO ANIMALS, Society for the Prevention of, the name for various humane organizations existing in most countries of the world, which have been influential in securing laws providing punishment for mistreatment of animals. Support is provided by popular subscription. The first society for this purpose was organized in 1824 in England. Scotland followed in 1839, and in 1866, through the influence of Mr. Henry Bergh, the first society of that kind in America was organized in New York. Other countries took up the movement and now there are similar societies in nearly every country in Europe, in Canada, Algeria, Australia, South Africa, Argentina, Brazil and Mexico. In some places laws passed through the influence of these societies regulate the treatment of wild animals in captivity as well as of domestic animals.

In nearly all countries legislation fixes a fine of from $5 to $100 or imprisonment from thirty to sixty days, or both, as a punishment for cruelty to any domestic animal. Through legislation, railways are required to unload, every twenty-four hours, for rest, feed and water, all live stock which is being shipped long distances. These societies are endeavoring to secure proper treatment of animals through education of the people rather than by force. In some cities ambulances and derricks have been provided for the removal of disabled and fallen animals. See Bergh, Henry.

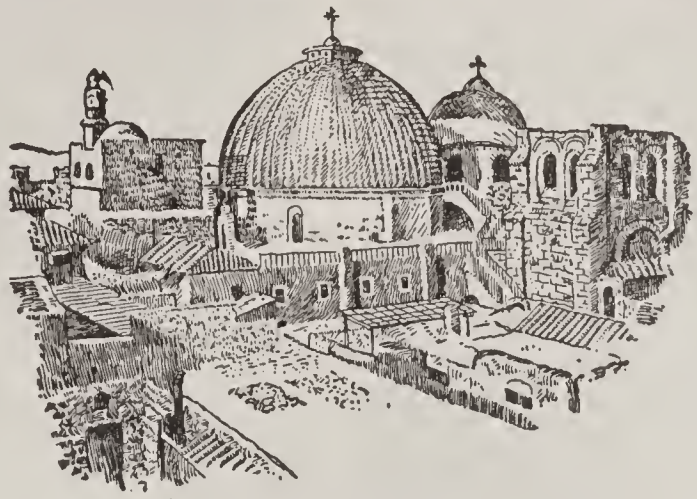
CRUIKSHANK, *krook'shangk,* George (1792-1878), an English artist born in London, famous for his caricatures. His father and elder brother were both caricaturists and at fifteen years of age he was fairly on the road to fame. He was a moralist as well as an artist, and as a total abstainer he finally consecrated his art to portraying the downward career of the drunkard. In 1837 he commenced his famous series of steel etchings illustrative of Dickens' *Oliver Twist,* which were full of pathos, humor and tragic power. For over half a century he caricatured the costumes, manners and vices of the English people.

CRUSADES, *kru saydz',* the Holy Wars of the Middle Ages, carried on from the eleventh to the thirteenth century by the Christian nations of Western Europe in the effort to wrest from its Mohammedan possessors the land where Christ had lived and died. The Crusaders took their name from the Latin word *crux,* meaning *cross,* for the Cross of Christ was their badge of warfare. No other great event of history has stirred the imagination of the world more than this long and bitter struggle for the possession of the Holy Land, and the traditions of the Crusaders are perpetuated in a collection of tales and poems of infinite variety. Sir Walter Scott's *Talisman* is one of the most celebrated stories of the Crusading period.

In the earlier pilgrimages to the first home of Christianity may be found the origin of the Crusades. From the time the Christian faith took root in Western Europe bands of pilgrims had made their way to the Holy Land to visit the sepulcher of Christ, and in the eleventh century, a period of religious revival, they

THE CRUSADES

Peter the Hermit preaching the Crusades



Church of the Holy Sepulcher at Jerusalem

At a shrine along the route

The Spirit of the Crusades

Costumes of the period

Landing of Saint Louis

traveled by the thousands along the highways leading to Jerusalem. Under the tolerant rule of the Saracen caliphs, these pilgrims were kindly treated, but all this was changed when, in 1071, Jerusalem was captured by the Seljuk Turks, a Tartar tribe fanatical in its loyalty to the faith of Mohammed.

Then came stories of brutal treatment and persecution, of exorbitant sums charged at the gates of Jerusalem and of unbearable insults to the Christian pilgrims. Western Europe was roused to a high pitch of religious fervor and indignation, and it was determined to wrest the Holy Sepulcher from the hand of the "Infidel." Besides this lofty religious ideal there were other forces arising from the spirit of the age which helped the movement—love of adventure, commercial ambition and the desire for military glory. All classes, from king to the lowest man in the realm, had their reasons for joining the forces which quickly prepared to march. Serfs seeking relief from conditions that had become unbearable and criminals fleeing from justice were present in the ranks of the Crusaders.

The First Crusade (1096-1099). The First Crusade was inspired by the preaching of Peter the Hermit, who on his return from a pilgrimage to the Holy Land aroused the multitudes everywhere by his vivid descriptions of the sufferings of the pilgrims. At the Council of Clermont, held in 1095, it was definitely decided to organize a Crusade, and Pope Urban II, addressing a great throng of clergymen and laymen, so moved them by his eloquence that they cried out as with one voice, "God wills it." This became the great battle cry of the soldiers during the Holy Wars.

In 1096 the first Crusaders, unorganized and without sufficient supplies, began the march toward Palestine. Nearly all of these perished before Constantinople was reached, and the few who succeeded in crossing the Bosporus were cut to pieces in Bithynia by the Turks. Later in the year, however, five well-equipped armies set out for Constantinople by different routes. They were led by Godfrey de Bouillon, Raymond of Toulouse, Robert of Normandy (the brother of William II of England), Robert of Flanders and other heroes.

Traversing Germany, Hungary and the Byzantine Empire, they passed over into Asia Minor, conquered Nicaea in 1097, gained a hard-won victory over the Turks at Dorylaeum, and in June, 1098, stormed the city of Antioch. Just a year later they laid siege to Jerusalem, which they captured after a desperate struggle. Godfrey de Bouillon was chosen ruler of the Holy City, and other nobles were left in control of Antioch and Edessa. These three cities were held by the Christians for nearly fifty years, their defense being aided by the Order of Knights Templar and Knights Hospitalers.

The Second Crusade (1147-1149). The recapture of Edessa by the Mohammedans in 1144 again aroused the Christians to a holy zeal, and a second Crusade was preached by Saint Bernard of Clairvaux. Early in 1147 two great armies under the German emperor, Conrad III, and the King of France, Louis VII, started for the defense of the Cross. The expedition was a total failure, and only a remnant of the great host reached home again.

The Third Crusade (1189-1191). This was led by Frederick Barbarossa of Germany, Philip Augustus of France and Richard I (the Lion-hearted) of England, and was undertaken after the capture of Jerusalem by Saladin, in 1187. Though Barbarossa was drowned in 1190, soon after reaching Syria, his soldiers fought with the French and English at the siege of Acre, which was captured after twenty-three months. Rivalries between Richard and the French king caused the latter to withdraw a few weeks later, and Richard, sole leader of the expedition, finally concluded a truce of three years and three months with Saladin, by which pilgrims were promised the right to visit the Holy Sepulcher, unmolested, while the seacoast from Tyre to Jaffa was to remain in the possession of the Crusaders.

The Fourth Crusade, known as the "false Crusade," never reached Palestine. It was undertaken at the suggestion of Pope Innocent III, and among its leaders were Baldwin of Flanders, Boniface of Montferrat, Geoffroy of Villehardouin and Simon de Montfort. The Crusaders assembled at Venice in the autumn of 1202, but were diverted from their purpose by the Venetians, who prevailed upon them to storm the city of Zara in Dalmatia. The army spent the winter there, and in 1204 captured and sacked Constantinople. In the same year a Latin empire was established at Constantinople, with Baldwin of Flanders as its first emperor.

The Later Crusades. The first four Holy Wars are the only ones to which all authorities assign the same numbers. The name *Fifth Crusade* (1228-1229) is usually applied to that undertaken by Frederick II, the German emperor, in fulfilment of a vow. Frederick proceeded to the Holy Land and by concluding a treaty with the Mohammedans secured possession of Jerusalem. For making this truce with the infidels he was severely upbraided by Pope Gregory IX. In 1244 Jerusalem was retaken by the Mohammedans.

The *Sixth* and *Seventh Crusades,* in 1248-1254 and 1270, respectively, were headed by Louis IX of France. He led an army into Egypt, but was soon defeated and captured, and secured his release only after paying a heavy ransom. In 1270 he started on the second expedition, but died at Tunis on the way to Palestine. In this Crusade he was associated with Edward Plantagenet (later Edward I of England), who landed an army at Acre in 1271, but accomplished nothing. In 1272 Edward returned home, and this year is usually regarded as the end of the Crusading period.

The Children's Crusade. Of several lesser Crusades, the most remarkable is the one undertaken in 1212 by a great army of boys and girls. About 30,000 children, most of them less than twelve years of age, placed themselves under the leadership of Stephen, a French shepherd lad

who declared that God had called him to the rescue of the Holy Land. When the children reached Marseilles they expected the waters of the sea to divide and give them passage to Palestine. Bitterly disappointed, many of them made their way homeward, but several thousand were lured on board seven ships by merchants who promised to take them to Palestine free of charge. Two of the vessels were wrecked off the coast of Sardinia, and the others carried the children to Alexandria, where they were sold into slavery.

About the same time another crusading band, consisting of 20,000 children, started southward from Germany, under the leadership of a boy named Nicholas. Thousands died of hunger and exposure on the way, and the remainder got no farther than Geneva. Few of these ever reached home again.

Results of the Crusades. Though the Crusaders failed to realize their great ideal, the Holy Wars profoundly influenced European history. By their warfare against the Turks the Crusaders delayed the fall of Constantinople three centuries, giving the young Christian civilization of the West an opportunity to conserve its strength before Mohammedanism again gained a foothold in Europe. By promoting commercial intercourse between the West and the East the Crusades added much to the wealth and prosperity of Europe, and were an important factor in the development of the great Italian seaports.

The Holy Wars helped to destroy feudalism, for large numbers of the nobles perished in the Crusades or lost their fortunes and their estates, and the power of the kings and common people was correspondingly increased. Europe also developed intellectually by these centuries of contact with the more advanced culture of the East. Finally, the Crusades awakened the spirit of exploration and discovery, and therefore played an important part in the epoch-making voyages of the fifteenth and sixteenth centuries. B.M.W.

Consult *Chronicles of the Crusades,* in "Everyman's Library"; Archer and Kingsford's *The Crusades.*

Related Subjects. The following articles in these volumes will give added light on the Crusades and on the period in which they occurred:

Bernard, Saint
Edward, subhead
Edward I
Feudal System
Frederick I, Barbarossa
Godfrey de Bouillon
Louis, subhead
Louis IX
Peter the Hermit
Richard, subhead
Richard I
Saladin

CRUSTACEANS, *krus ta' she anz,* members of the shellfish family named *Crustacea,* some of the larger types of which are among the favorite sea-foods of all nations, the smaller ones furnishing an important source of food to other marine animals. This family forms the most important class of joint-footed animals, the Arthropoda (which see). The familiar crawfish, crab and lobster are three of the best known of the 10,000 present species of crustaceans, most of which are sea animals, although a few are found in fresh waters and on land.

Although the structure and also the habits of crustaceans vary, all have a hard body coating; in some this is almost bonelike, while in others it is merely tough and leathery. The body consists of a number of segments, either free or joined together. All appendages, such as legs, feet, feelers (antennae) and jaws are arranged in pairs and are jointed. There are two or more compound or single eyes, usually stalked. The animals are reproduced by means of eggs which are generally hatched in water, although some species, like lobsters, carry eggs and young on the under side of the abdomen. As the animals grow, their skins become tight and a painful process of casting off skin and shell and growing new coverings must be passed through. Crustaceans possess great powers of reproduction of lost parts, such as feet, claws and feelers. Most of these animals eat decaying animal matter and so are useful in ridding waters and beaches of carrion.

Related Subjects. A more detailed knowledge of the structure and importance of the crustaceans may be gained from a study of the following articles:

Barnacle
Crab
Crawfish
Fiddler Crab
Hermit Crab
Horseshoe Crab
Land Crab
Lobster
Shrimp

CRYPT, *kript,* a word derived from the Greek *kryptein,* meaning *to hide,* and now applied to a vault under an old church or cathedral in which the bodies of saints and martyrs were placed. The crypt was usually the nucleus of the church which was to be erected over it, elevating the altar of the saint to whom the edifice was dedicated. In early ages the crypt also contained altars for the worship of saints and martyrs whose bones were supposed to be deposited there. One of the most famous and beautiful of existing crypts is found beneath Glasgow Cathedral, made famous by Sir Walter Scott in his novel *Rob Roy.* Saint Peter's, Rome, and the cathedrals of Canterbury and Gloucester also contain crypts of great historical interest and architectural beauty.

CRYPTOGAMS, *krip' toh gamz,* or **FLOWERLESS PLANTS,** is a term which includes all plants which do not bear seeds. The name is derived from Greek words meaning *hidden marriage,* or "reproduction that is difficult to see." Among the cryptogams are the ferns, the mosses and the algae and fungi. The name is really applied in error, due to the fact that it was at one time believed that stamens and pistils were the only sex organs and so the reproduction of flowerless plants seemed obscure. The sex reproduction of cryptogams by spores is really more clear than that of *phanerogams* by seed. See Botany; Phanerogams; Spore.

CRYSTALLINE, *kris' tal in,* **ROCKS.** Granite and marble, especially when polished, show that they contain a great number of crystals cemented together. Rocks having this structure are called *crystalline rocks.* Some varieties of quartz, limestone and hornblende are masses of crystals and make very beautiful cabinet specimens. Most crystalline rocks once existed in a molten state and crystallized as they cooled. See Igneous Rocks.

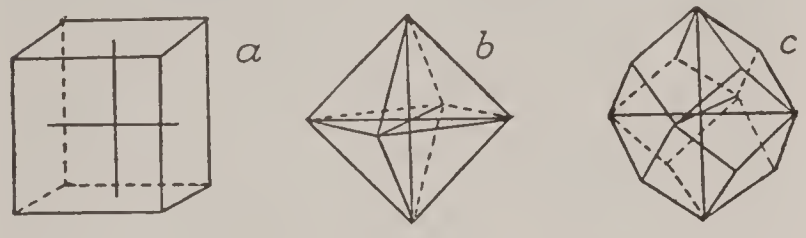


FIG. 1

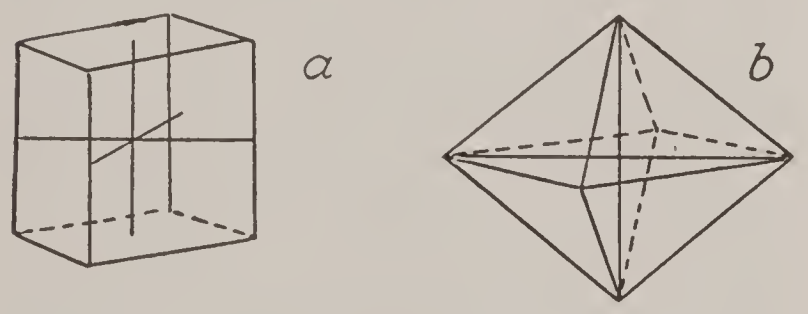


FIG. 3

CRYSTALLIZATION, *kris tal i za' shun.* Let us make some rock candy. We will dissolve granulated sugar in hot water until we have a syrup. We will then stretch one or more strings across the vessel in the syrup and set it away to cool. In a few hours clusters of crystals will be formed about the strings, and these crystals make our rock candy. Let us examine them. How many sides have they? Are all the sides the same size? Do all the crystals have the same number of sides? Get some rock salt and compare it with the crystals of sugar. How do they differ? Dissolve as much alum as you can in hot water. Stretch strings through the solution and let it cool. How do the crystals of alum differ from those of the sugar and the salt?

By these experiments and the examination of the substances with a magnifying glass, we learn that many solid substances are formed by masses of crystals crowded together. This method of formation is called crystallization.

Systems of Crystals. Notwithstanding the large number of crystals, they are all systematically arranged and are classified under six systems, all of which are based upon the cube and its modifications. To illustrate, the cube has six sides or faces. If we cut four of its edges we have increased the number of faces to ten; if we cut all the edges we increase the number to eighteen. Now if we cut the corners we have a solid with twenty-four surfaces. The systems of classification are as follows:

The Regular Cubic System. The perfect crystals of this system are cubes. Common

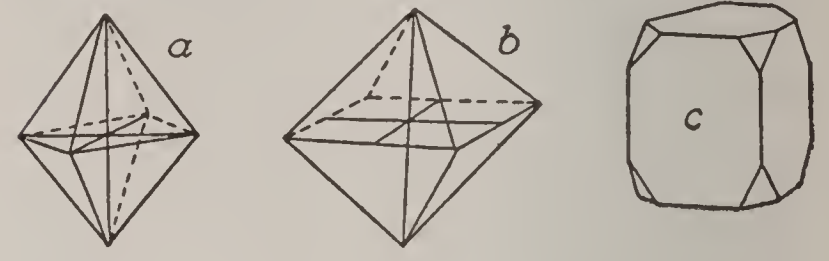


FIG. 2

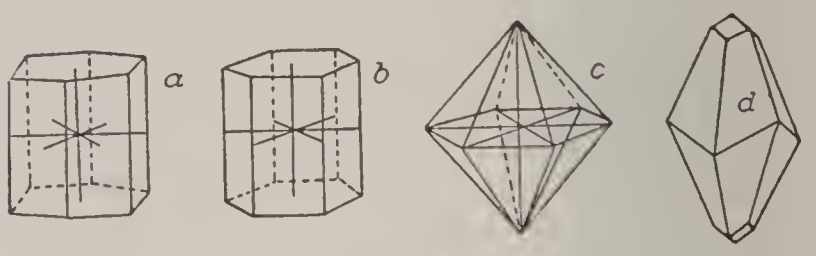


FIG. 4

salt, iron pyrite, galena, lead ore, silver, copper and gold are all illustrations of this system (Fig. 1). By cutting the cube as shown in *b* a double pyramid with equal faces is formed. By cutting the edges as shown in *c* we have a crystal with twelve equal sides. Alum and the garnet are good illustrations.

FIG. 5

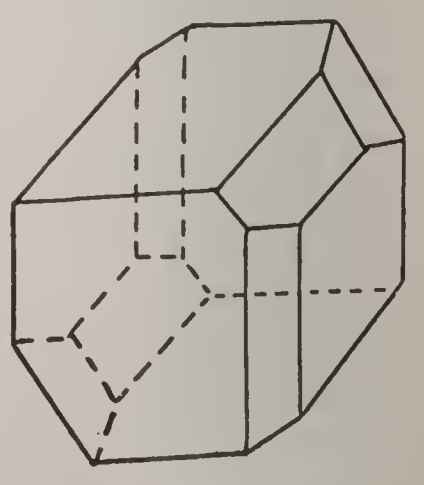


FIG. 6

The Square Prismatic System. The rectangular prism forms the basis of this system (Fig. 2). This gives the prism and the

pyramid in various combinations illustrated in *a, b* and *c*. There are no common substances illustrating this system.

The Right Prismatic System. The basis of this system is a prism whose bases are oblongs (Fig. 3). By cutting the faces we have the double pyramid with unequal faces, *b*. The topaz and sulphur crystallize in this system.

The Six-Sided Prismatic System. This is generally known as the *hexagonal* system. Its foundation is a six-sided prism, *a* (Fig. 4). The modifications are illustrated by *b, c* and *d*. Quartz, ice, snowflakes and calcite crystallize in this system.

The Oblique Prismatic System. The foundation of this system is an oblique prism (Fig. 5). Sal soda, borax, gypsum and copperas crystallize in this system.

The Double-Oblique Prismatic System. This system differs from No. 5 in having all the faces of the crystals oblique to each other (Fig. 6). The crystals are complex. Blue vitriol and some forms of tartaric acid are good illustrations.

W.F.R.

CUBA, an island republic, poetically called the PEARL OF THE ANTILLES because of its beauty and natural wealth, lies at the entrance to the Gulf of Mexico, dividing the opening into two channels. It is ninety miles south of Key West, Fla., and about 130 miles east and north of Yucatan. About fifty miles to the east is the island of Haiti. Havana, the chief port and an important city, is 1,197 miles from New York and 597 miles from New Orleans.

The name, a relic of the original inhabitants, now extinct, is pronounced *Kooba'* by the islanders, and this is not unlikely to become the general pronunciation in North America with the increasing intimacy of international relations, since it is a point on which some local sensitiveness has been shown.

Cuba was one of the earliest American possessions of Spain, and was one of the two last to slip away from Spanish rule. For ages it has been a favorite winter resort for people of northern lands, and its history has been at times so closely connected with that of the United States as to render it especially interesting to Americans. Since 1900 it has been an independent republic, with some concessions of guardianship to the United States. Including numerous small islands, or *keys,* at the north and south, and the Isle of Pines at the south, all of which are a part of Cuban territory, the area of Cuba is about 44,164 square miles. It is therefore almost as large as Pennsylvania, or New Brunswick and Nova Scotia combined.

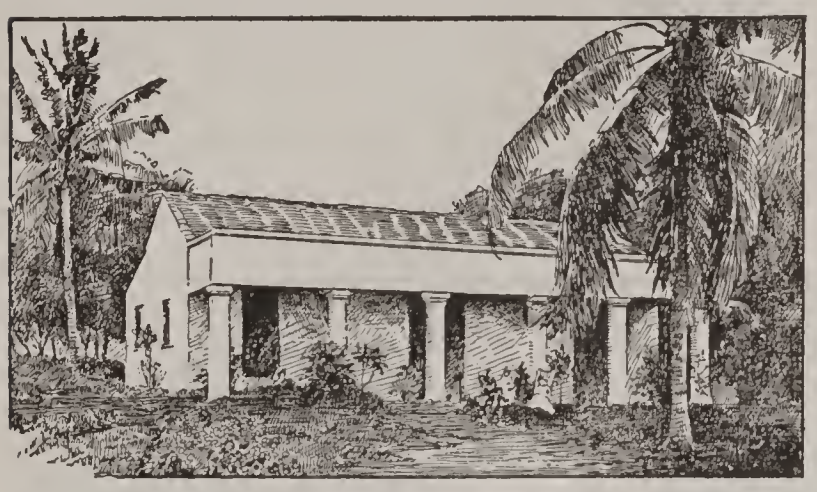
The People. The population of Cuba in 1919 was reported as about 2,889,000, of whom about 74 per cent are whites. The remainder are chiefly negroes and negro mixtures, but there are 12,000 Chinese. The prevailing religion is the Roman Catholic. The white families have nearly all been settled for generations on the island, and were long restless under the Spanish rule, for the reason that they were treated merely as provincials or dependents and excluded from participation in the executive responsibilities and honors of the insular government; the latter were monopolized by officials from the mother country. The term *pobre Cubano* (poor Cuban), applied to them in Spain, wounded their sensibilities.

There was much of class distinction in Cuba under the rule of Spain. The wealthy were educated and refined, but no adequate provision was made for the education of the poor. The census of 1899 showed that sixty-four per cent, or nearly two-thirds, of the people were unable to read or write. The Church fostered education and charities, but the government was neglectful of both.

It will be seen that the people of Cuba, of whatever class, have been, until recently, depressed and dissatisfied with conditions, although possessing a land of beauty, fertility and promise and enjoying the very valuable cultural inheritance from Spain; and that the

provincial character ascribed to white Cubans was artificial rather than real. The Spanish language is everywhere spoken, and the elegance of Spanish social forms is in evidence.

Education. During Spanish rule in Cuba education was largely controlled by the Church, but provisions made therefor were insufficient.



A RURAL HOME

Such houses are occupied by fairly prosperous people.

While Americans were occupying the island (1898-1902) the school system was reorganized, and by 1919 census returns showed that 81 per cent of the people could read. Primary education is free and compulsory. In 1919 over 335,000 pupils were enrolled in nearly 3,000 public schools, but the average attendance was but a little over half that number. There is a university at Havana, attended by over 2,275 pupils, and the liberal arts and sciences, medicine, pharmacy and law are taught.

Commerce and Principal Cities. The most important cities of Cuba are seaports. Havana, the capital, on the northwest coast, is the chief port and the tobacco center of the republic. Ships from all parts of the world enter its harbor. It has few wharves, but this condition is of financial advantage to those who make a business of removing cargoes. Ships anchor off shore and cargoes are removed by lighters. It has been estimated that it costs as much to bring a ton of freight to shore at Havana as to ship it all the way from Liverpool.

Connected with Havana by rail are Santiago de Cuba, the mineral and sugar port at the southeast; Matanzas, a northwestern port, the most noted sugar center of Cuba; Cienfuegos, on the south-central coast, another important sugar center; and Camagüey, the largest city in the interior. Each of these five cities is more fully described elsewhere in these volumes.

Since Cuba's independence in 1898 its commerce has turned largely to the United States. In recent years over eighty-nine per cent of its export trade has been with the United States and its possessions, nine per cent with the United Kingdom, about two per cent with Germany and less than one per cent with Spain, the nation which at one time had a monopoly on Cuba's commerce. Americans, to succeed in business in Cuba, should speak the Spanish language and study to accommodate themselves to the easy-going Cuban temperament.

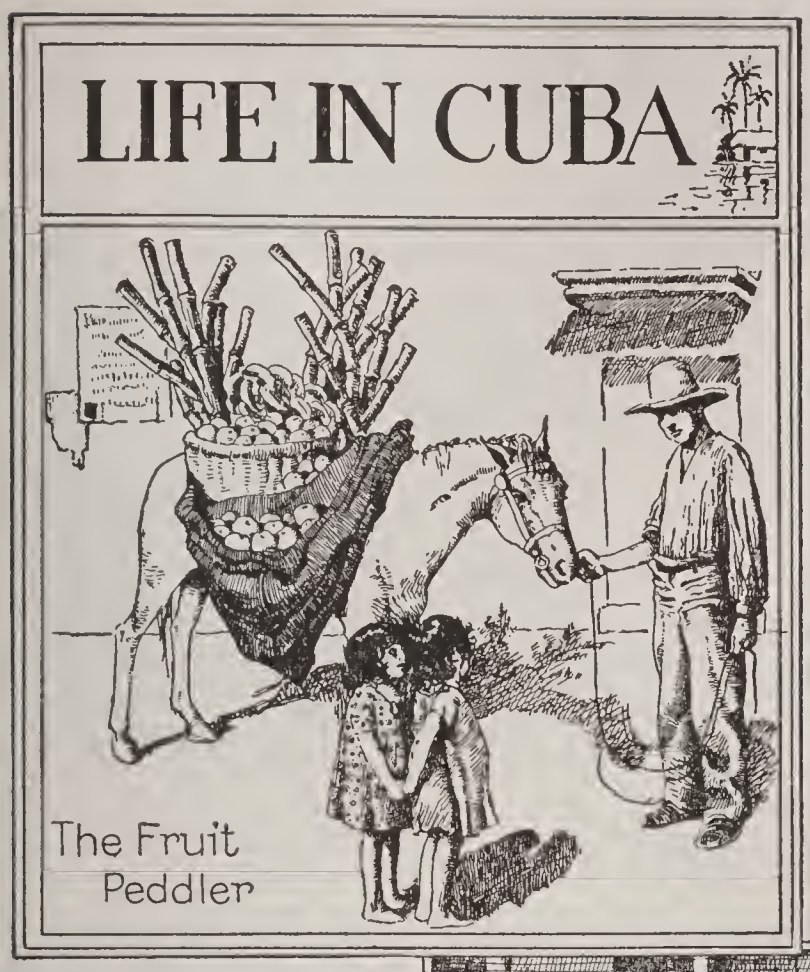
Sugar forms over seventy-five per cent of the exports, and tobacco twenty per cent. The principal imports are cotton goods and machinery. Yearly exports of Cuba have been valued at over $1,250,000,000, and imports at about half that sum. Although Cuba has its own system of coinage, United States money is legal tender throughout the island.

Transportation. The Cuban government is continually improving the highways of the island, but transportation facilities are yet insufficient. Roads are bad, and in the rainy season they are almost impassable. Still, Cuba was twelve years ahead of the mother country, Spain, in the introduction of the railroad, the first line of about forty miles being opened in 1837, connecting Havana with Guines. By 1902 railway communication extended nearly from one end of the island to the other, and then commenced a new era of industrial and commercial opportunity. The center of the railway system is at Havana, and the principal towns of the island in 1921 were connected by about 3,200 miles of

THE HOME OF A NATIVE

railway. Large sugar estates are connected with the main lines by private lines. Over 1,360 miles of cart roads are open to traffic. Two cents will carry a letter from the United States to the island.

Physical Features. In general, the eastern and western sections of this long, narrow island are mountainous, the loftiest point being Tur-



quino, which rises to a height of 8,320 feet above the eastern plateau. In the center is a region of gently-rolling plains, broken here and there by low, rounded hills, and it is here, rather than in the mountain sections, that Cuba's most picturesque scenery is to be found. The Yumuri Valley is the "show spot" of the island. Numerous streams drain the valleys and the coastal plains, but they are too rapid in the wet season and too shallow in the dry season to be of much use for navigation.

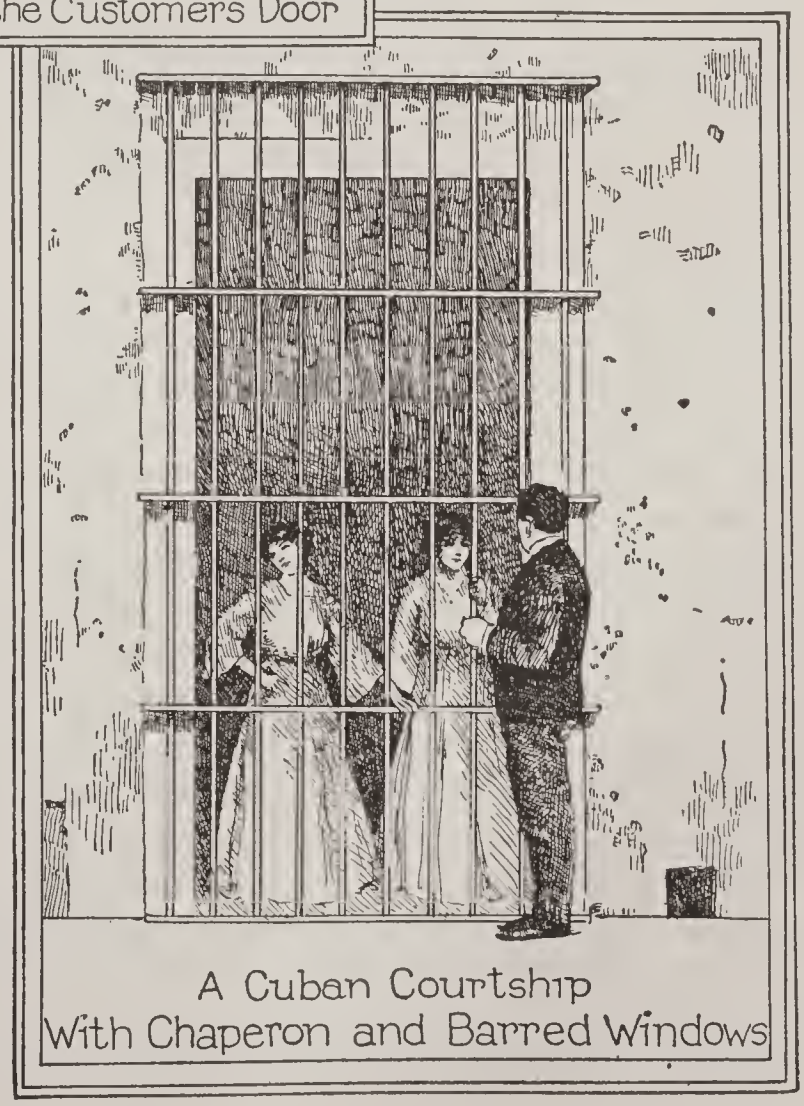
Climate, Vegetation and Animals. Cuba lies just inside the torrid zone. On the coast the climate is very even, but inland it is not so equable. The coast temperature seldom drops below 65° in winter, but in the mountains the thermometer often falls lower than 50°. Coast temperature in summer is usually not higher than 90°. The average temperature for the island in January varies between 72° and 75°. The July temperature averages about 82°.

Almost everywhere in Cuba the rainfall is sufficient for agricultural purposes, only a few small areas in the interior requiring irrigation. At Havana the rainfall is over fifty inches annually, and in some northeastern sections it reaches over 100 inches. The southern coast regions have much less rainfall, however, for less moisture passes over the mountains. Rain falls throughout the year, but the chief rainy season comes in summer. During August, September and October hurricanes are liable to occur, for Cuba lies within the path of these West Indian storms. Trade winds from the northeast prevail.

Before 1901 yellow fever and other diseases were common in the lowlands, owing to unsanitary conditions. The government, acting upon measures adopted by United States military authorities during their occupation of the island, has now practically wiped out this dreaded disease.

In this warm southern land, with soil so rich that almost anything will grow, vegetation is luxuriant. Products of economic value are sugar cane, tobacco, coffee, cacao and all tropical fruits such as the banana, cocoanut, pineapple, orange, lemon, lime, date, fig, guava and pomegranate. Palms, including the useful royal palm, grow everywhere, and fields are covered with beautiful flowers and fragrant plants. In about 13,000,000 acres of forest grow some of the finest cedar and mahogany in the world, as well as such other trees of the trop-

Cows are milked at the Customer's Door


A Cuban Courtship With Chaperon and Barred Windows

THE ISLAND OF CUBA

The large map shows the provinces, chief cities and important railroads of Cuba. The smaller one, in the corner, gives the location of the island with respect to Florida and Yucatan.

ics as the ebony, logwood and rosewood. Quail, snipe, wild turkeys, grouse, buzzards and vultures are plentiful. Hogs, dogs and cats run wild in great numbers.

Although there are but few snakes, there are a number of disagreeable forms of animal life. Among them are scorpions, centipedes and tarantulas, as well as land crabs and flying cockroaches, and worst of all, the flea which gets under the skin, called the *nigua,* or *jigger.* This is the side of life which is most irritating, both to natives and to visitors.

Cuban waters are well stocked with fish. Large sharks are common, and in coast waters the porpoise and manatee, or sea cow, are found. Crocodiles, alligators, chameleons, small lizards and tree toads are among the creeping inhabitants of this tropical land.

Agricultural Development. Previous to Cuba's last war for independence (1895-1898), the country contained over 90,000 plantations, farms, cattle ranches and orchards, valued at nearly $200,000,000. During the war many of these were completely destroyed, but after 1899 agricultural industries again developed. The simple wooden plow of four centuries ago is still in quite general use, and oxen are still the patient farm animals, yet the slowly-moving Cubans alone produce almost one-fourth the world's supply of sugar cane. The manufacture of sugar is very costly, but in 1920 there were 192 mills on the island, and about one-half the cultivated lands were given over to sugar. The yearly crop has risen since 1914 from 3,000,000 tons to 4,446,229 tons in 1919, valued at $1,005,500,000; most of this sugar went to the United States. The war raised the price of sugar, and the people of Cuba planted cane in yet greater abundance. Thousands of acres which had never before been cultivated are now being used for the raising of sugar cane, although prices have fallen from the high level.

The next product in importance is tobacco, and about one-tenth of the cultivated land is given to that crop. About seventy per cent of the output is produced in the province of Pinar del Rio. The tobacco crop in 1919 was worth $2,373,966. Since prohibition became effective in the United States the manufacture of liquors has increased nearly sixty per cent.

Corn, or maize, rice and sweet potatoes are raised for home use. Coffee is raised, but is not so important a product as formerly; in this industry it is becoming increasingly difficult to compete with Brazil. Fruits are easily cultivated, and fruit interests are chiefly in the hands of American companies. Almost 30,000 tons of pineapples, about 40,000 tons of bananas and over 3,000,000 cocoanuts are exported yearly.

Cattle raising is an important industry, especially in the fertile province of Camagüey. There are over 3,965,000 head of cattle on the island, and about 780,000 horses, 64,570 mules and 2,500 asses.

Manufacturing and Other Industries. The manufacture of raw sugar, cigars and cigarettes are about the only manufacturing industries of Cuba, and they are both closely connected with agriculture. Directly south of Havana, on the south coast of Cuba, at the little town of Batabano, the sponge industry is important.

Scarcity of labor is a problem which Cuba

OUTLINE AND QUESTIONS ON CUBA

Outline

I. Location and Size

(1) Latitude, 19° 40′ to 23° 13′ north
(2) Longitude, 74° to 85° west
(3) Situation with reference to other land masses
(4) Area
  (a) Actual
  (b) Comparative

II. Physical Features

(1) Coast line
  (a) Length, 2,500 miles
  (b) Numerous harbors
(2) Surface characteristics
  (a) Mountains at east and west ends
  (b) Undulating plain in center
(3) Rivers
  (a) Uselessness for navigation

III. Climate and Life

(1) Tropic conditions
  (a) Equalizing effects of sea
(2) Rainfall
(3) Unhealthfulness
  (a) Effect of sanitation measures
(4) Vegetation
(5) Animal life

IV. Industries

(1) Agriculture
  (a) Primitive methods
  (b) Chief crops
    1. Sugar cane
    2. Tobacco
    3. Coffee
    4. Fruits
  (c) Stock raising
(2) Manufacturing
  (a) Sugar
  (b) Cigars and cigarettes
  (c) Labor problems
(3) Mining
(4) Lumbering

V. The People

(1) Proportion of various races
(2) Customs and manners
(3) Religion
(4) Education
  (a) Under Spanish rule
  (b) Under present-day conditions

VI. Commerce and Transportation

(1) Commercial centers
(2) Imports
(3) Exports
(4) Railroads
(5) Highways and cart roads

VII. Government

(1) Republican form
(2) Departments and their duties
(3) Conditions of citizenship

VIII. History

(1) Discovery and settlement
(2) Repeated insurrections against Spain
(3) Interference of the United States
(4) Independence secured
(5) Recent progress

Questions

About how many miles would a letter have to travel in going from San Francisco to Cuba? How much would you have to pay to send it?

From what labor troubles have the sugar planters suffered? Why have not these affected the tobacco manufacturers as well?

To what happening did the slogan "Remember the Maine" owe its origin?

Where does it cost as much to carry a ton of freight a few rods as to carry it elsewhere a thousand miles or more? Why?

How large a part of the world's supply of sugar cane does Cuba produce?

How far is Havana from New York? from New Orleans?

What part had people from the United States taken in Cuba's fight for freedom before 1898?

Why does the Cuban milkman need no milk wagon?

Who besides a Cuban may ever become President of the republic?

What were the conditions under which the Cubans lived during the Spanish rule?

has to meet in most of its industries. The abolition of slavery in 1883 reduced the supply of black labor; the Chinese government stopped emigration of Chinese coolies to Cuba because it was said they were inhumanly treated, and the war of 1895 decreased the ranks of the laboring class. The problem is more serious to sugar planters than to manufacturers of tobacco products, for in the latter industry skilled white labor can be used.

Mineral Resources. Southeastern Cuba, near Santiago de Cuba, in the province of Oriente, is the mining section of the island. Iron, copper and manganese are the principal products. Mining interests are chiefly in the hands of American companies; most of the output is sent to the United States, and on an average 50,000 tons of iron a month are exported to that country. Gold deposits and rich beds of asphalt are not largely worked as yet.

Government. Cuba is governed in accordance with the constitution adopted by a representative convention, February 21, 1901. The government is republican in form and differs but slightly from that of the United States. The head of the administration is the President, who must be a native Cuban or a naturalized citizen who served ten years in the Cuban army during the wars of independence. He is elected by popular vote for a term of four years, and cannot serve more than two consecutive terms. He appoints and removes members of his Cabinet, who are responsible to him for the administration of their departments.

CUBAN COAT-OF-ARMS
Background of upper half is blue; lower half, green. The horseman's coat is red. The horse, clouds and cherubim are the color of silver.

Legislative power is vested in a Congress, consisting of two houses, a Senate and a House of Representatives. Four Senators from each of the six provinces form the Senate body. They are elected by a board composed of the councilmen of the province and of electors, chosen by the people, equal to twice the number of councilmen. One-half of the Senators retire every four years. The House of Representatives consists of one member for every 25,000 inhabitants or for a fraction thereof more than 12,500. They are elected for four years, one-half retiring every two years. Congress holds two annual sessions, controls the financial and foreign affairs of the republic and makes general laws for the administration of the national government, and prepares electoral laws for the provinces and municipalities.

Every male Cuban over twenty-one years of age who is mentally sound, who has not been convicted of crime and who is not serving in the army or navy, all Spanish male residents who have been on the island since April 11, 1899, and all male foreigners who have resided there since January 1, 1899, are entitled to vote. Foreigners who have taken up their residence there since January 1, 1899, are required to show five years' residence before naturalization.

History. Columbus discovered Cuba in 1492. His son Diego (James) founded Santiago de Cuba in 1514. Five years later Havana was founded. The enslavement of the native population led to its extinction in less than two generations, and negro slaves were imported from Africa. Misgovernment was the rule during nearly all of Cuba's colonial history, heavy taxes being levied upon its production and commerce for the benefit of Spain. Havana was taken by the French in 1534, and again in 1554, and in 1762 by the British in the European Seven Years' War which ended in 1763 (see SEVEN YEARS' WAR). But all these occupations were temporary.

The first insurrection of Cubans against Spain was led in 1833 by Manuel Quesada, who demanded for the island representation in the Spanish Cortes (Congress). Peace did not come until 1842, when various reforms were conceded, though representation in the Cortes was still denied. In 1850 Narciso Lopez, with 600 American filibusters, landed at Cardenas, to overthrow the colonial government; but the movement was quickly suppressed. In the next year Lopez repeated his attempt, but was defeated and executed, though his American followers were pardoned. A third filibuster in 1853 led England and France to ask from the United States a disavowal forever of an intention to take possession of Cuba, but this request was declined. The Ostend Manifesto of 1854 was not really a manifesto, but was an expression of opinion and advice by the American ministers accredited to Great Britain, France and Spain, addressed to the government of the United States, recommending it to pur-

chase Cuba from Spain or to seize the island if purchase plans should fail. Spain refused to sell the island, though offered a hundred million dollars for it; and the Manifesto was repudiated by the American people. See Ostend Manifesto.

In 1875 the United States complained to Spain that the condition of insurrection in Cuba could no longer be endured. A vigorous attempt was made by the mother country to suppress it in the following year. In 1895 a Cuban republic was proclaimed at Najassas, but the Spanish General Campos defeated the republicans at Matanzas. In the next year the cruel General Weyler succeeded Campos and angered the American people by his atrocities.

In 1898 the United States battleship *Maine,* while visiting Havana, was mysteriously blown up, supposedly by a submarine mine, though this was not known to be a fact. The press of the United States clamored for intervention in behalf of the Cubans. This action followed, and a war with Spain resulted. The Spanish force was defeated by the Americans in Cuba at San Juan Hill, near El Caney, on the 1st of July; and the Spanish fleet, which had been shut in the harbor of Santiago de Cuba, was destroyed on the third by the fleet of Admiral Sampson, who was absent at the time, the chief honor of the victory being accorded to Commodore Schley.

Peace was made in the following year, and Spanish claim to the island was forever abandoned. Cuba was recognized as a nation by the powers of the world on entering into an agreement with the United States giving the latter the right of intervention when necessary and the use of naval stations; certain stipulations were also made in 1902 as to finances and foreign relations. In 1905 intervention by the United States for the preservation of order became necessary, and the American occupation continued until 1909, when President Jose Miguel Gomez was inaugurated. He was succeeded in 1913 by Mario Menocal, a graduate of Cornell University. President Menocal was reëlected in 1916. In 1914 Cuba borrowed largely from American capitalists for the promotion of a considerable number of modern governmental enterprises.

Insurrection of 1917. When President Menocal was elected in 1916 the vote was so close between him and Alfredo Zayas that Jose Miguel Gomez, the retiring President and leader of the Zayas party, demanded that the Supreme Court reverse the result and declare Zayas elected. The demand was ignored, and Gomez threatened the government with attack and Menocal with death. The two parties may be loosely termed conservatives, under Menocal, and radicals, under Gomez.

The term of President Menocal was to expire on May 20, 1917; the radicals prepared to gather in force to seize the machinery of government and assure themselves of power to name his successor. They did not expect to become active until March, but in January the government discovered and frustrated a plot to kidnap President Menocal. Gomez and his followers escaped from Havana and scattered over the island and gathered recruits from among the discontented. They burned sugar plantations of adherents of the administration, as a means of striking at the finances of the opposition. Skirmishes which cannot be dignified as battles occurred between the regular forces of the republic and the revolutionists, in nearly all of which the former were victorious. Suspected traitors were forced from the army, four city mayors were arrested, and loyal militia companies were organized.

Meanwhile, the United States, by virtue of its right, reserved when the republic was organized, found it necessary to send the Cubans a warning that insurrection must cease; that the power of the American government would be used, if necessary, to sustain the regularly-constituted authority. In 1921 the United States intervened in a financial crisis.

On April 8, 1917, Cuba followed the lead of the United States and declared war upon the German Empire. Its help could be but slight, but it was appreciated. E.D.F.

Consult bulletins of the Pan-American Union, Washington, D. C., sent on request; Porter's *Industrial Cuba;* Roosevelt's *The Rough Riders;* Canini's *Four Centuries of Spanish Rule in Cuba.*

Related Subjects. The following articles in these volumes contain much information which will be of help to the reader interested in Cuba:

CITIES AND TOWNS

Camagüey
Cienfuegos
Havana
Matanzas
Santiago de Cuba

HISTORY

Columbus, Christopher
Filibusters
Garcia y Iniguez, Calixto
Gomez y Baez, Maximo
Ostend Manifesto
Palma, Tomas Estrada
Spanish-American War

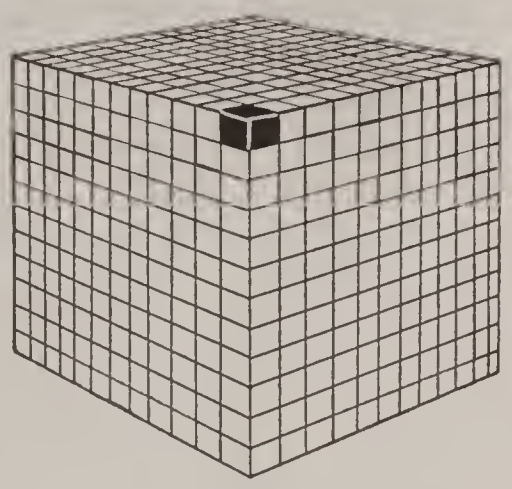
LEADING PRODUCTS

Banana
Cocoanut
Coffee
Pineapple
Sugar
Tobacco

UNCLASSIFIED

Isle of Pines

CUBE, a regular solid having six equal square faces. By *solid* is meant a body having three dimensions—length, breadth and thickness. In finding the *volume* or contents of a solid, that is, the *space* it occupies, the cube is used as a unit of measure, and the result is expressed in cubic inches, cubic feet, etc. The volume of a cube is found by using three times as a factor the number which expresses the length of one of its edges; that is, a cube whose edge is 4 inches in length contains 4×4×4, or 64, cubic inches. For this reason the third power of any number, which is the product of that number taken three times as a factor, is called its cube; for example, the cube of 2 is 8; the cube of 3 is 27. For practical application of the theory of the cube and its relations, see CUBIC MEASURE; MENSURATION.



A CUBE

The figure, reduced in size, represents a cubic foot. Each face is twelve inches in length and width. The volume is 12×12×12 inches, or 1,728 cubic inches. The small black cube is one-twelfth of the length, breadth and thickness, or one cubic inch. There are 1,728 such small cubes in the entire body.

CUBEBS, *ku'bebs,* the dried, unripened berries of a shrub belonging to the pepper family, the *piper cubeba.* It is used in Eastern countries as a flavoring and in Europe and America for medicinal purposes. The shrub is native to Penang, Sumatra, New Guinea and neighboring islands. The dried berries look much like black pepper, but are less pungent and of more agreeable flavor than that spice. The drug prepared from cubebs acts as a stimulant and is sometimes used in treating indigestion. When prepared in the form of cigarettes cubebs are sometimes thought to afford relief for hay fever, asthma and inflammation of the pharynx.

PARTS OF CUBEB PLANT

(*a*) Branch; (*b*) flower; (*c*) berry growing from flower stalk.

CUBE ROOT. When it is desired to find the length of one of the sides of a cube, that fact is usually ascertained by actual measurement. If, however, the number of cubic units in the volume of the cube is known, the length of any side may be found by figuring the *cube root* of the number representing the volume. The cube root of a number is one of its three equal factors, as illustrated below. The knowledge of how to find the cube root of large numbers is not of great practical importance to the average person, but such problems have considerable value for mental discipline, and they are interesting exercises to anyone with a taste for mathematics. We will begin this subject with a study of the roots of small numbers:

$2\times2\times2=8$; 8 is the *cube* of 2, and 2 is the *cube root* of 8.

$12\times12\times12=1728$; 1728 is the *cube* of 12, and 12 is the *cube root* of 1728.

The cube of 6 is written 6^3. The small figure 3 is called the *exponent.*

The cube root of 216 is written $\sqrt[3]{216}$. The $\sqrt{\ }$ is called the *root sign,* or *radical sign.*

How to read the indicated operations:

I. 6^3 may be read in full, as follows:
(a) Multiply 6 by 6, and that product by 6;
(b) Use 6 as a factor 3 times;
(c) The third power of 6;
(d) The cube of 6;
(e) 6 cubed.

II. $\sqrt[3]{64}$ is read as follows:
(a) What number used as a factor 3 times gives 64? It can be seen clearly this way: $n\times n\times n=64$. What is n?

(b) Cube root of 64.

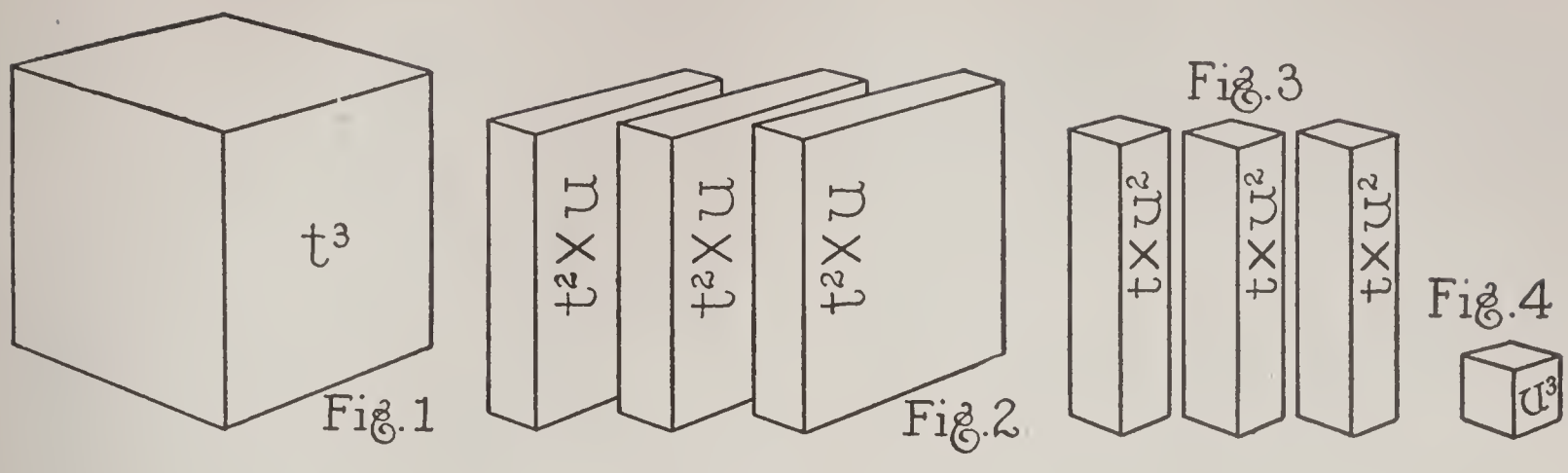
It may be written $n^3=64$ and read, "What number cubed gives 64?" This use of n should be common in the arithmetic class; it is very helpful in making things clear, but should be read "number" or "what number," not read "n."

Exercise in reading:

(1) $4^3=4\times4\times4=64$.
(4 used as a factor three times is $4\times4\times4=64$.)

(2) $6^3=6\times6\times6=216$.
(6 cubed is $6\times6\times6=216$.)

(3) $8\times8\times8=8^3=512$.
$9\times9\times9=9^3=729$.
(Read just as they appear.)



PARTS OF A CUBE

Fig. *a*, at left, represents the cube of the tens; Fig. *b*, left center, the square of the tens times the units, taken three times; Fig. *c*, right center, the tens times the units, taken three times; Fig. *d*, at right, the cube of the units.

(4) $n \times n \times n = 27$.
What number used as a factor 3 times gives 27?

(5) $n \times n \times n = 216$;
$n = 6$.
6 used 3 times as a factor gives 216 or $6 \times 6 \times 6 = 216$.

(6) $n^3 = 27$;
$n = 3$.
This is read, "What number cubed gives 27?"
"3 cubed gives 27, or,
$3 \times 3 \times 3 = 27$."

(7) $\sqrt[3]{27} = 3$.
This is read, "The cube root of 27 is 3."

Cube and Cube Root of Common Fractions. Following are examples illustrating this phase of cube root:

$\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

$\sqrt[3]{\frac{1}{8}} = \frac{1}{2}$.

$\left(\frac{2}{3}\right)^3 = \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \frac{8}{27}$.

$\sqrt[3]{\frac{8}{27}} = \frac{2}{3}$.

$\left(\frac{4}{5}\right)^3 = \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \frac{64}{125}$.

$\sqrt[3]{\frac{64}{125}} = \frac{4}{5}$. Proof: $\frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \frac{64}{125}$.

$\sqrt[3]{\frac{27}{64}} = \frac{3}{4}$ Proof: $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = \frac{27}{64}$.

$\sqrt[3]{\frac{8}{125}} = \frac{2}{5}$ $\frac{2}{5} \times \frac{2}{5} \times \frac{2}{5} = \frac{8}{125}$.

$\sqrt[3]{\frac{125}{216}} = \frac{5}{6}$ $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} = \frac{125}{216}$.

$\sqrt[3]{\frac{27}{1000}} = \frac{3}{10}$ $\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} = \frac{27}{1000}$.

The cubes of the tens from 10 to 90 can be easily learned by memorizing the cubes from 1 to 9.

$1^3 = 1$.	$10^3 = 1000$.
$2^3 = 8$.	$20^3 = 8000$.
$3^3 = 27$.	$30^3 = 27000$.
$4^3 = 64$.	$40^3 = 64000$.
$5^3 = 125$.	$50^3 = 125000$.
$6^3 = 216$.	$60^3 = 216000$.
$7^3 = 343$.	$70^3 = 343000$.
$8^3 = 512$.	$80^3 = 512000$.
$9^3 = 729$.	$90^3 = 729000$.

Cube and Cube Root of Decimal Fractions. The cube of the decimal fraction offers no new difficulty. A product contains as many decimal places as all its factors contain; for example, $.6 \times .6 \times .6 = .216$. Therefore, from the above we have:

$.1^3 = .001$.	$.01^3 = .000001$.
$.2^3 = .008$.	$.04^3 = .000064$.
$.3^3 = .027$.	$.09^3 = .000729$.
$.5^3 = .125$.	
$\sqrt[3]{125} = 5$.	$\sqrt[3]{729} = 9$.
$\sqrt[3]{.125} = .5$.	$\sqrt[3]{.729} = .9$.
$\sqrt[3]{.000125} = .05$.	$\sqrt[3]{.000729} = .09$.

In all the above problems it is possible to get the cube root at sight or by a little careful inspection.

Cube Root by Factoring. The next simple method is that of factoring where the three equal factors are not so apparent. For example:

(1) $\sqrt[3]{15625} = n$.
$15625 = 5 \times 5 \times 625$.
$5 \times 5 \times 625 = 5 \times 5 \times 5 \times 125$.
$5 \times 5 \times 5 \times 125 = 5 \times 5 \times 5 \times 5 \times 25$.
$\sqrt[3]{15625} = 25 \times 25 \times 25$.

(2) $\sqrt[3]{4096} = n$.
$4096 = 4 \times 1024$.
$4 \times 1024 = 4 \times 4 \times 256$.
$4 \times 4 \times 256 = 4 \times 4 \times 16 \times 16$.
$\sqrt[3]{4096} = 16 \times 16 \times 16$.

We can find the cube root of an indicated product by factoring. For example, "What is the edge in inches of a cubic space whose capacity is 8 cubic feet?"

Volume in cubic inches $= 8 \times 1728$.
Edge in inches $= \sqrt[3]{8 \times 1728} =$
$7\sqrt[3]{(2 \times 2 \times 2) \times (12 \times 12 \times 12)}$.
Edge in inches $= 2 \times 12 = 24$.

$\sqrt[3]{27 \times 216} = \sqrt[3]{3 \times 3 \times 3 \times 6 \times 6 \times 6} = 3 \times 6 = 18$.

$\sqrt[3]{512 \times 343} = 8 \times 7 = 56$.

$\sqrt[3]{729 \times 125} = 9 \times 5 = 45$.

The above problems are all solved more or less freely by inspection.

Cube Root of Numbers Consisting of 10's and Units. We shall see first how such numbers are cubed and of what their cubes consist; then we can understand how to find the cube root of a number.

Let us cube 26.

$26 = 20 + 6.$

$26^3 = (20+6)^3$, or

$26^3 = (20+6) \times (20+6) \times (20+6).$

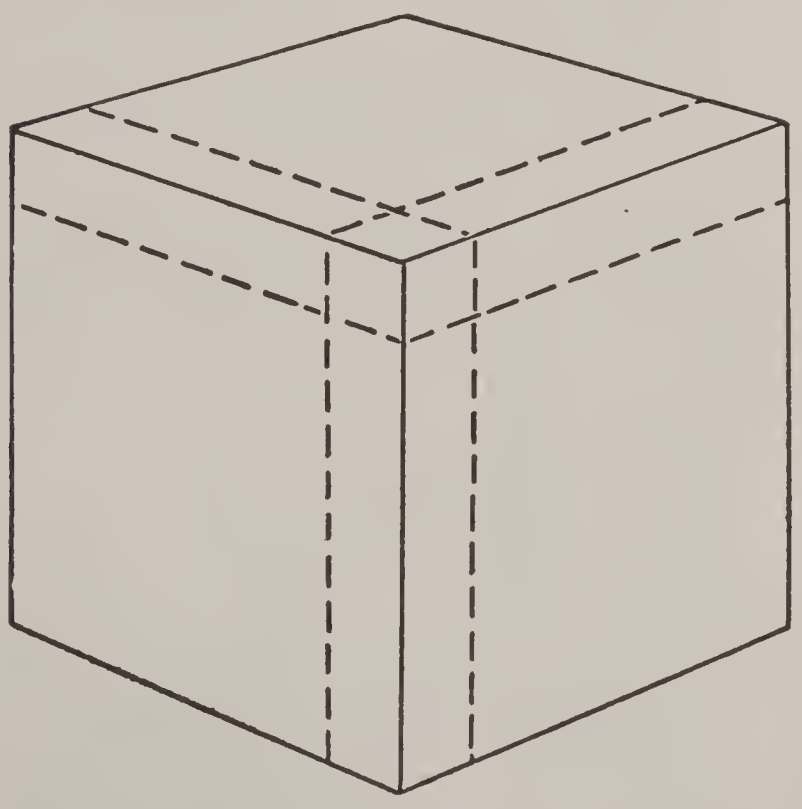
$$\begin{array}{l} 20 + 6 \\ 20 + 6 \\ \hline 20^2 + (20 \times 6) \\ \quad + (20 \times 6) + 6^2 \\ \hline 20^2 + 2 \times (20 \times 6) + 6^2 \\ \qquad\qquad 20 + 6 \\ \hline 20^3 + 2 \times (20^2 \times 6) + \quad (20 \times 6^2) \\ \qquad (20^2 \times 6) + 2 \times (20 \times 6^2) + 6^3 \\ \hline 20^3 + 3 \times (20^2 \times 6) + 3 \times (20 \times 6^2) + 6^3 \end{array}$$

Therefore:

$$26^3 = 20^3 + (3 \times 20^2 \times 6) + (3 \times 20 \times 6^2) + 6^3.$$

Translating this into words, we have: "The cube of a number is made up of the cube of the tens, and 3 times the square of the tens times the units, and 3 times the tens times the square of the units, and the cube of the units."

The figure below shows these parts together as the *whole cube.*



$t^3 + 3(t^2 u) + 3(t u^2) + u^3$

THE COMPLETED CUBE

Following this truth we write out the cube of 38, and have: $38^3 = 30^3 + (3 \times 30^2 \times 8) + (3 \times 30 \times 8^2) + 8^3$.

Putting the general truth into concise form, we have: $(\text{tens} + \text{units})^3 = \text{tens}^3 + (3 \times \text{tens}^2 \times \text{units}) + (3 \times \text{tens} \times \text{units}^2) + \text{units}^3$.

Or, using t for tens and u for units, we have:

$$(t+u)^3 = t^3 + (3 \times t^2 \times u) + (3 \times t \times u^2) + u^3.$$

From this we are able to find the cube root of a number, as below:

Let us take 941192. Some number has been cubed to give this. It is indicated thus:

$n^3 = 941192$

$n = \sqrt[3]{941192}.$

The process of finding the cube root:

$$\begin{array}{r|l} & 90+8 \\ & 941192 = t^3 + (3 \times t^2 \times u) + (3 \times t \times u^2) + u^3 \\ & \overline{729000} = t^3 \\ \overline{3 \times 90^2 =} & \overline{212192} = (3 \times t^2 \times u) + (3 \times t \times u^2) + u^3 \\ 24300 & 194400 = 3 \times t^2 \times u \\ \hline & \overline{17792} = (3 \times t \times u^2) + u^3 \\ & 17280 = 3 \times t \times u^2 \\ & \overline{512} = u^3 \\ & 512 = 8^3 \end{array}$$

"What is the largest cube of tens in the number?" Thinking of 941000 (which contains the 10's cubed) as 941, we find 729, or 9^3, the largest cube. Nine is the cube root of this, but 9 tens is 90, and $90^3 = 72900$, which we take out; the remainder, 212192, must contain the rest of the cube, namely $(3 \times t^2 \times u) + (3 \times t \times u^2) + u^3$. Since the first term, $3 \times t^2 \times u$, is much the largest part of the remainder, we may for the moment consider $212192 = 3 \times t^2 \times u$. We have the product of three numbers and have two known numbers, 3 and 90^2, to find u, the one not known, as expressed in the following:

$$212192 = 3 \times 8100 \times u.$$

Therefore, to find u, we divide 212192 by 24300, and find $u = 8$. Now we take out $3 \times t^2 \times u$ or $3 \times 90^2 \times 8$, and have left 17792, which must contain $(3 \times t \times u^2) + u^3$, the rest of the cube. We take out $3 \times t \times u^2$ or $3 \times 90 \times 64$ or 17290, and have left 512, which equals 8^3 or u^3. So we have found that 941192 is the cube of 98 or $\sqrt[3]{941192} = 98$. This is the simplest method for those not familiar with algebra. For more advanced students the problem may be worked as follows:

$$\begin{array}{r|l} & 90+8 \\ & \overline{941192} = t^3 + 3t^2u + 3tu^2 + u^3 \\ & 729000 = t^3 \\ 3t^2 = 24300 & \overline{212192} = (3t^2 + 3tu + u^2)\ u \\ 3tu = \ 2160 & 212192 \\ u^2 = \ \ 64 & \overline{\qquad} \\ \overline{26524} & \end{array}$$

First find the largest cube of tens, which is seen to be 729, and the cube root, 9 tens or 90; take out 90^3, and there is left 212192, which must contain the other three terms of the cube; that is,

$$212192 = 3t^2u + 3tu^2 + u^3, \text{ or,}$$
$$212192 = (3t^2 + 3tu + u^2)u.$$

Since $3t^2u$ is much the largest part of the three quantities, we may for a moment neglect the other two and have $212192 = 3t^2u$. We have the product of three numbers and two of them given to find the third. We find u by dividing 212192 by 3×90^2 and get $u = 8$. Then we substitute 90 for t and 8 for u in each part inside the parentheses and get the entire divisor as shown, 26524. This multiplied by u, or 8, gives 212192. This shows that we find in 941192 the cube of 98. Therefore, 98 is the cube root of 941192, or $\sqrt[3]{941192} = 98$.

The usual method followed after the subject is understood is given below accompanied by an illustration:

$\sqrt[3]{373248}=n$

		72
		373248
		343
3×70^2	=14700	30248
$3\times70\times2$	= 420	30248
	4	
	15124	

Separate the number into periods of three digits each, beginning at the right. Find the largest cube in the first period, 373. It is 343. Place its cube root, 7, in the answer. Subtract the largest cube, 343, and bring down the next period. Divide the remainder by three times the square of the tens (in this case $3\times70^2=14700$), and place the quotient (2 in this case) in the answer beside the number already there; in this case this gives 72 in the cube root. Then add to the trial divisor (as $3\times\text{tens}^2$ is called) three times the tens times the units, which in this case is $3\times70\times2=420$, and add also the square of the units, which in this case is 4. Then multiply the sum of these three, which is the real divisor, in this case 15124, by the units, which in this case is 2, and place the product under the dividend. The product, 30248, is the same as the dividend, and 72 is the cube root of 373248.

Another illustration, when there are three digits in the root:

$\sqrt[3]{187149248}=n.$

		572
		187149248
		125
3×50^2	=7500	62149
$3\times50\times7$	=1050	
7^2	= 49	60193
	8599	1956248
3×570^2	=974700	
$3\times570\times2$	= 3420	
2^2	= 4	1956248
	978124	

The only new point in this problem is that 57 becomes the tens at the second division, and the divisor, $3\times\text{tens}^2$, becomes 3×570^2.

Cube Root of Decimals. In taking the cube root of a number containing a decimal, we separate it into periods, beginning at the decimal point, and marking off into periods of three digits each, to the left for the whole number and to the right for the decimal, as,

67′842.368′795.

If the decimal part has not 3, 6, or 9, etc., places, zeros are added, as:

32.687′49.
32.687′490.

The cube root of a decimal has ⅓ as many decimal places as the cube has. The cube is the product of three equal factors; therefore, it contains three times as many decimal places as the cube root. If a given number is not a perfect cube, annex decimal zeros, in groups of threes; carry it out as many decimal places as is desired. For example:

$$\sqrt[3]{750}=\sqrt[3]{750.000'000'000,}$$

which will give the cube root to three decimal places.

Cube Root of Common Fractions. This is touched upon in the early part of the article, but we shall generalize it here:

$$\left(\frac{7}{8}\right)^3=\frac{7}{8}\times\frac{7}{8}\times\frac{7}{8}=\frac{7^3}{8^3}=\frac{343}{512}.$$

Therefore, $\sqrt[3]{\frac{343}{512}}=\frac{\sqrt[3]{343}}{\sqrt[3]{512}}=\frac{7}{8}.$

The cube root of a common fraction is a fraction whose numerator is the cube root of the numerator of the first fraction, and whose denominator is the cube root of the denominator of the first fraction, as,

$$\sqrt[3]{\frac{216}{343}}=\frac{\sqrt[3]{216}}{\sqrt[3]{343}}=\frac{6}{7}. \qquad \sqrt[3]{\frac{a^3}{n^3}}=\frac{\sqrt[3]{a^3}}{\sqrt[3]{n^3}}=\frac{a}{n}.$$

A.H.

CUBIC, *ku'bic,* **MEASURE,** the system used in the measurement of solids, that is, bodies having the three dimensions of length, breadth and thickness. It derives its name from the cube, which is the unit of measure employed in finding the contents, or volume, of solids (see Cube). The volume of a regular solid is found by multiplying together the numbers representing its three dimensions.

Practical Applications. The following table, which should be memorized, contains the values commonly used in the solution of problems based on the cube:

1728	cubic inches (cu.in.)	=1 cubic foot (cu. ft.).
27	cubic feet	=1 cubic yard (cu.yd.).
231	cubic inches	=1 gallon.
2150.4	cubic inches	=1 bushel.
24¾	cubic feet	=1 perch of stone.

(a) How many cubic yards will be taken out in digging a cellar 15 feet wide, 40 feet long and 8 feet deep?

(b) What will it cost to build a stone wall 30 rods long, 3½ feet high and 1 yard thick, at $6.50 a perch?

(c) How many bushels of oats will a bin hold which is 2 yards long, 2½ feet wide and 5 feet, 4 inches high? How many gallons of water would a tank of equal size contain?

Short Methods. The following rules will be found helpful in the quick solution of various practical problems:

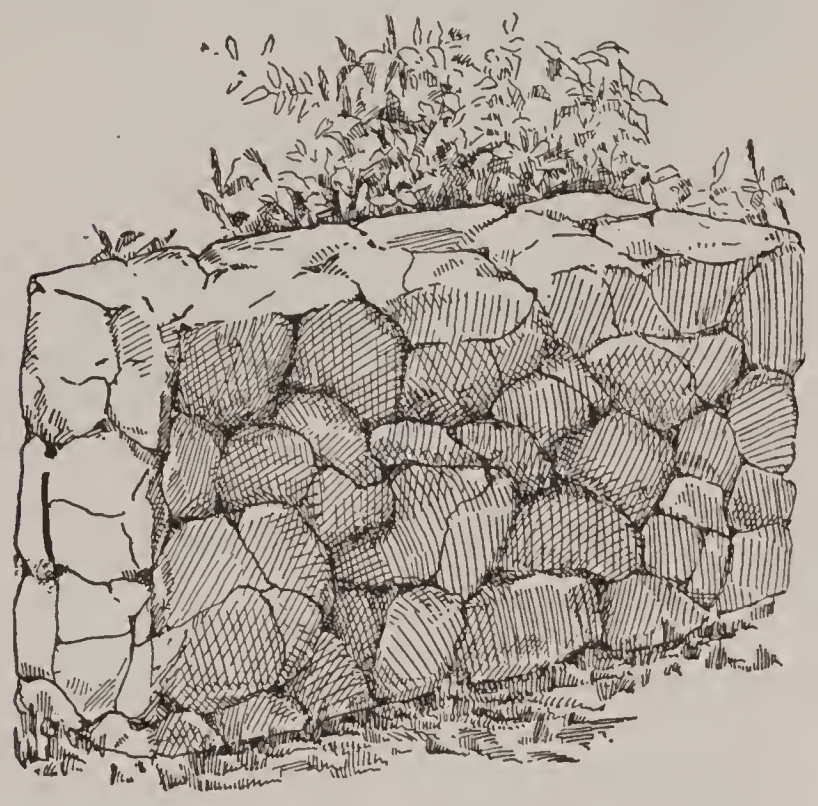
(1) To find the number of cubic feet in a log multiply one-fourth of the average circumference by itself and multiply the product obtained by the length, which will give the contents in cubic feet.

(2) A full-sized cord of wood is a solidly-built pile 8 feet long, 4 feet wide and 4 feet high, containing $8\times4\times4$, or 128, cubic feet.

(3) A cord of stone will make approximately 100 cubic feet of wall.

(4) Three bushels of lime and one cubic yard of sand will lay a cord of stone.

Practical Problems. (a) How many cubic feet are there in a log 40 feet long, 15 inches in diameter at one end, and 18 inches at the other? (To find the circumference at each end, use the rule: The circumference of a circle is equal to 3.1416 times the diameter.)



A CORD OF STONE

Solution of (a). 15 inches $=1\frac{1}{4}$ feet. 18 inches $=1\frac{1}{2}$ feet. Circumference of log at smaller end $=3.1416\times1\frac{1}{4}$ feet $=3.927$ feet. Circumference of log at larger end $=3.1416\times1\frac{1}{2}$ feet $=4.7124$ feet. Average circumference $=\frac{1}{2}(3.927+4.7124)$ feet $=4.3197$ feet. Contents of log in cubic feet $=40\times4.3197\times\frac{4.3197}{4}=186.598$.

(b) In stove-wood measure, each stick is 16 inches long. How many cords of stove wood could be made from a full-sized cord of wood?

(c) If the full cord is bought for $3.00 and sawed into stove lengths as in problem (b) and sold for $1.25 a cord, what is the profit?

Solution of (b) and (c). Since the full-sized cord is 4 feet (48 inches) wide, as many cords of 16-inch wood can be made from it as $48\div16$, or 3. The stove wood is sold for $3\times\$1.25$ or $3.75. The profit is therefore $3.75 − $3.00 or $.75.

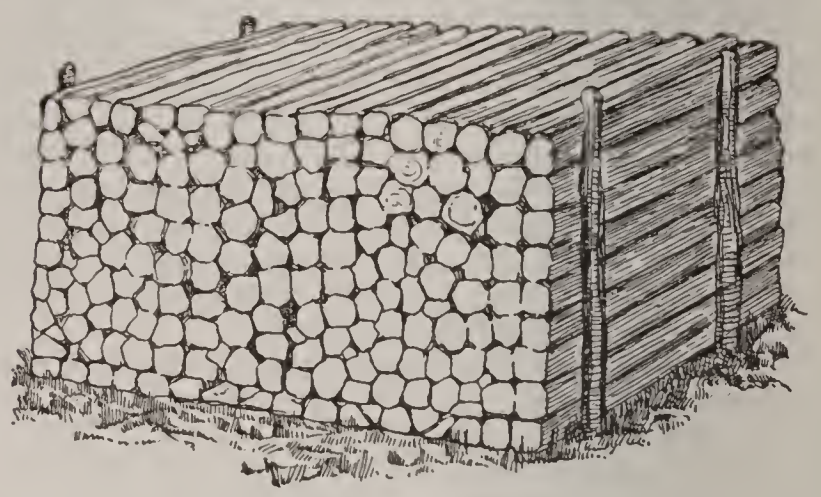
Measures for Crops. (1) A ton of dry hay is estimated at 500 cubic feet to the ton. To find the number of tons in a mow, multiply the length in feet by the height in feet and then by the width in feet and divide the result by 500.

(2) To find the number of tons in a stack, multiply the width in feet by the length in feet by ½ the height and divide by 500.

(3) To find the contents of a round stack, multiply the distance around the stack in feet by itself and then multiply by 4 times the height in feet, striking off two places from the right of the result thus obtained. This gives the number of cubic feet in the stack, and by dividing by 500, the number of cubic feet occupied by a ton of dry hay, the number of tons is found. If the dimensions of the stack are given in yards the same process should be followed, except that at the end the cubic contents of the stack should be divided by 18.5 instead of 500. There are 18.5 cubic yards in the space occupied by a ton of hay.

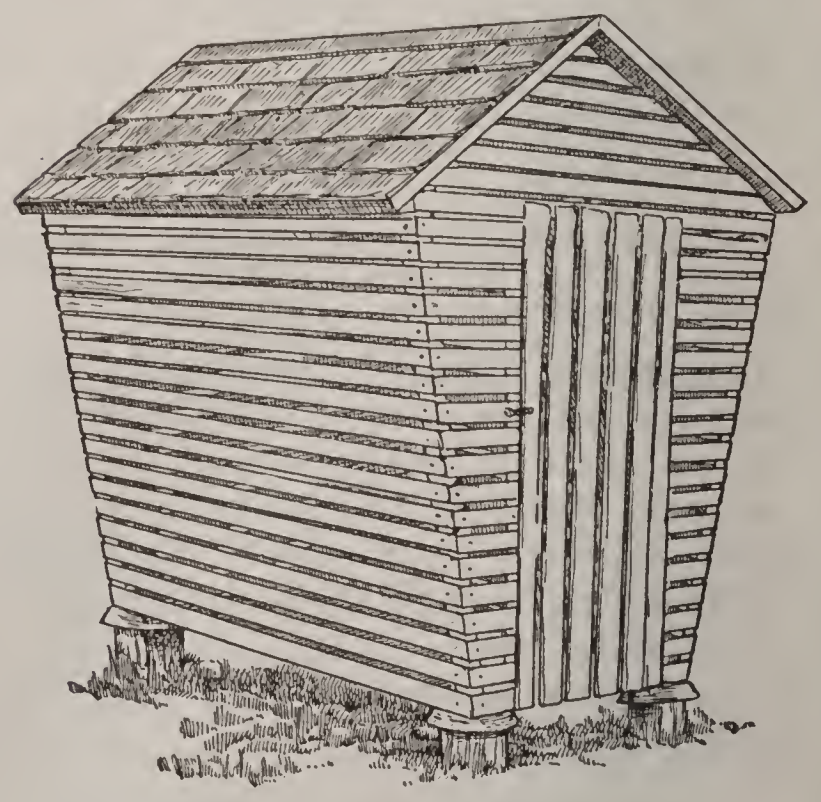
(4) To find the contents of a crib in bushels of shelled corn, multiply the number of cubic feet in the crib by 8 and strike off the right-hand figure; that is, divide by 10. This is equivalent to eight-tenths of the number of cubic feet in the crib. One cubic foot of space holds eight-tenths of a bushel of shelled corn.

(5) To find the number of heaped bushels of ear corn contained in a crib, multiply the number of cubic feet in the crib by 4 and strike off the right-hand figure. This is equivalent to taking four-tenths of the number of cubic feet, and is correct because one cubic foot holds about four-tenths of a bushel of ear corn.



A CORD OF WOOD

(6) When the sides of the crib are flared, that is, wider at the top than at the bottom, it is necessary to take the average width in estimating. Take one-half the sum of the top and bottom widths as the average. Multiply this figure by the height, and then multiply by the length. The result will be the cubic area of the crib. Then, to find the number of bushels of ear corn, multiply this result by 4 and strike off the right-hand figure.



A CORN CRIB

If this structure is eight feet wide at the top of the door and five feet wide at the bottom, the average width is six and one-half feet.

Practical Problems. (a) How many tons of hay are there in a mow 30 feet long, 10 feet high and 20 feet wide?

Solution of (a). $30\times10\times20=6{,}000$, number of cubic feet in the mow. $6{,}000\div500=12$, number of tons.

(b) A stack is 20 feet long, 10 feet high and 15 feet wide. How many tons does it contain?

(c) How many tons in a circular stack 20 yards around and 5 yards high?

(d) A crib 18 feet long, 18 feet high and 8 feet wide is filled with shelled corn. How many bushels does it hold?

Solution of (d). $18\times10\times8=1{,}440$, number of cubic feet in crib. $1{,}440\times8=11{,}520$. Striking off the right-hand figure we have 1,152, number of bushels the crib will hold. B.M.W.

CUBIST SCHOOL OF PAINTING, a school of modern art, whose adherents prefer symbols to realities. It dates from 1913 and is the aftermath of the Post-Impressionist Movement (see IMPRESSIONIST SCHOOL OF PAINTING). By means of geometric figures, cubes, triangles and parallelograms the Cubist aims to produce an abstract sensation upon the mind of the observer of his work. As one critic has said: "He takes the elements of expression from the forms and colors of nature and uses them not to represent objects but to produce an organism which will contain in terms of art what a given subject means to him in terms of sensation."

The Cubist has shown the possibility of an expression in painting without representation, a process familiar for centuries in music; in fact, the Cubist believes that the painter can do with line and color what the composer does with sound, stating his belief in these words: "If a musician composes a pastoral symphony he does not imitate the mooing of cows, the bleating of sheep and the rippling of brooks. Therefore, if I paint a pastoral symphony, why should people insist upon seeing in my painting that which they cannot hear in the music of Mozart or Beethoven?" His art, therefore, largely makes its appeal to the psychological faculty of man by means of the artist's own particular code of signs and symbols. The Cubist demands an independent right to express himself as he wishes in each canvas and to paint an apparent mood as freely as does the poet or musician.

Paul Picasso is the founder and leading exponent of Cubism; one of his most famous paintings is *The Woman with the Mustard Pot.* Other noted followers are Marcel Duchamp, noted for his *Nude Descending a Staircase;* and Francis Picabia, represented by his *The Dance at the Spring.* Just what the effect of this new tendency in art will have upon the future it is too early to predict, but it is apparently a transient vagary. R.D.M.

CUCKOO, *kuck'oo,* a bird known in Europe as the "darling of the spring." There are nearly 200 known species, common in warm countries. The two commonest in the United States and Eastern Canada are the black-billed and the yellow-billed cuckoos, yet even they are not as familiarly known as many other birds, and their note is a rather harsh *kuk kuk,* unlike the sweet tones of the European species, which gave the bird its name. The song of the cuckoo has inspired many poets.

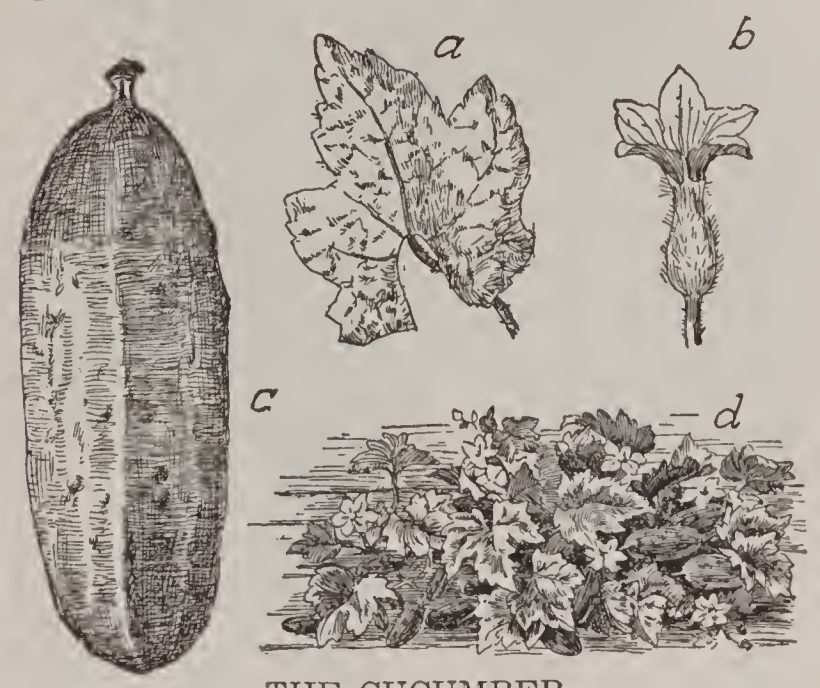
THE CUCKOO

The two American species of cuckoo are slender, about a foot in length, with long, rounded tails and long, sharp, arched bills. Their toes, two pointing forward and two backward, are especially adapted to clinging rather than to climbing. Their feathers are a beautiful olive-brown, with a bronze tint. The chief difference in the two species is in the color of bill; however, the black-billed species has red circles about its eyes and the yellow-billed has white "thumb-nail" marks on its tail. In the Middle, Western and Southern states the yellow-bill is known as the *rain-crow,* as it is believed when its call is heard it is a sign of rain. Perhaps the reason for this is that cuckoos delight in damp, cloudy weather. The European cuckoo has ashy-gray plumage, barred with black beneath, and its tail is marked with white.

The favorite home of the cuckoo is near running water. It eats insects and hairy caterpillars, and so is of benefit to man. Mulberries, too, are eaten greedily by these woodpeckerlike birds. Cuckoos lay from two to five pale green-blue, unpolished eggs. The American species builds a rather untidy nest and hatches its own eggs, but the European cuckoo lays its one small egg on the ground, then picks it up and deposits it in the nest of another bird, where the unwilling mother cares

for it (see COWBIRD). The day before the young cuckoo leaves the nest it is covered with sharply-pointed pin feathers, and looks like a little porcupine, but in twenty-four hours it has a coat of soft, beautiful feathers.

CUCUMBER, *ku'kum ber,* a garden vegetable, oblong and oval in shape, used green as a salad and for pickling. It probably originated in Northern India at least three thousand years ago; since that time it has passed from coun-



THE CUCUMBER
(*a*) Leaf; (*b*) flower; (*c*) fruit; (*d*) vine.

try to country and is now widely cultivated in nearly every part of the temperate zones.

The melonlike vine which bears the fruit has a rough trailing stem with tendrils for climbing, hairy leaves with three to five pointed lobes, and short-stalked, yellow, bell-shaped flowers, the male and female flowers both on the same vine. The vegetable itself, according to the species, grows from four to thirty inches long. It contains numerous flattened seeds in a somewhat watery pulp. Cucumbers are picked for use before ripe, for if allowed to turn yellow and to ripen they are tough and very full of seeds. Like tomatoes, they are soaked in water before peeling, then thick pieces are removed from the ends and sides, as the skins contain unwholesome juices. After the peeled portion is sliced, salting removes more of the undesirable juice and makes the cucumbers more digestible. Served as a salad with cream dressing, the vegetable is as nutritious as fresh celery. Small cucumbers used for pickling are sometimes called *gherkins.*

Cucumbers require a rich, moist, warm loam, and as they are very sensitive to frost they are often grown under glass to supply the early summer demand. Indoors the seed should be planted in March, outdoors from April to July, one-half ounce of seed being required for 100 feet. The seed should be planted one inch deep. It is usually planted in little hills, enriched with well-rotted manure, and about six feet apart each way. The plants are subject to a number of diseases and insect pests, but these can be checked by careful use of fungicides and poisons (see INSECTICIDES AND FUNGICIDES).

CULLOM, *kul'um,* SHELBY MOORE (1829-1914), an American statesman whose career is fittingly summarized in the title of the book which he published in 1911, three years before his death—*Fifty Years of Public Service.* He was born in Wayne County, Ky., was admitted to the bar in 1855, and began the practice of law at Springfield, Ill. Becoming an active leader in Illinois politics, he was several times elected to the state legislature, and sat in the national House of Representatives for three terms after 1865. As a delegate to the National Republican Convention of 1872 he placed General Grant in nomination for the Presidency. Between 1876 and 1883 he was governor of Illinois, in the latter year entering the United States Senate as a Republican. To this body he was reëlected for every term until the one beginning in 1913. Cullom was the author of the Interstate Commerce Law and served for many years as chairman of the Senate Committee on Interstate Commerce. In 1898 he was one of the commissioners to establish American government in Hawaii.

In 1913 he accepted his last public appointment, that of commissioner in charge of the Lincoln Memorial at Washington, D. C. No other service could have been more pleasing to him than this, for he was one of Lincoln's personal friends.

CUMBERLAND, *kum'ber land,* MD., the county seat of Allegany County, noted chiefly for its large coal interests. It is situated in the extreme northwestern section of the state, on the Potomac River and on the Chesapeake and Ohio Canal. Pittsburgh is 150 miles northwest; Baltimore and Washington are respectively 178 and 152 miles southeast. Railway transportation is provided by the Baltimore & Ohio, the Cumberland & Pennsylvania, the Pennsylvania and the Western Maryland railroads. Cumberland was founded in 1785 on the site of Fort Cumberland, which was built in 1754-1755; the town was incorporated in 1815 and became a city in 1850. It was the first city in Maryland to adopt the commission form of government (1909). In population it is second in the state, ranking next to Baltimore;

in 1920 the population was 29,837, a gain of 36.6 per cent in ten years.

Cumberland occupies a site 700 feet above tide-water in a locality noted for picturesque scenery. Besides possessing scenic beauty, this district is rich in coal deposits, great quantities of the semi-bituminous variety being shipped from Cumberland. Manufacturing, in which large capital is invested, is represented by steel mills, iron foundries, cement works, tanneries, glass works and large rolling mills engaged in making railway supplies.

CUMBERLAND, R. I., a town in the extreme northeastern part of the state. The population decreased from 10,107 in 1910 to 10,077 in 1920. The town is situated near the Pawtucket and Seekonk rivers, in Providence County, six miles north of Providence and thirty-eight miles southwest of Boston. Three branches of the New York, New Haven & Hartford Railroad serve the city, and electric lines connect with towns north and south. The town was settled in 1646, was incorporated in 1747, and was named for Cumberland, England.

Beautiful hills and wooded districts surround Cumberland, and coal, copper, gold and granite are found in the vicinity. The interests of the town are largely centered in the manufacture of cotton, silk and horseshoes. A Carnegie Library adds to the educational advantages of the public school system, which has fifteen elementary schools and a high school. The only Cistercian Trappist Monastery in New England is located here.

CUMBERLAND MOUNTAINS, the name given that division of the Appalachian Mountain system which extends across the eastern part of Tennessee and forms the boundary between Virginia and Kentucky. The region covered by the division is a plateau about 2,000 feet high and fifty miles wide, on which rise several ranges of hills or low mountains to the height of 500 or 600 feet. The slopes of the plateau are steep. The region is covered with forests of chestnut, oak, ash and other hard woods. An opening through these mountains where Kentucky, Virginia and Tennessee meet is the celebrated "Cumberland Gap," through which early settlers wended their way westward into Kentucky and Tennessee, and which was traversed by both the Confederate and the Union forces during the War of Secession.

CUMBERLAND RIVER, a large tributary of the Ohio River, which rises in the highlands in Southeastern Kentucky, flows westward into Tennessee, and after making almost a half-circle in that state, returns to Kentucky and mingles its waters with those of the Ohio, near Smithland. Its winding course is 688 miles in length, and its drainage basin is over 18,000 square miles in area. At the Great Falls, in Whitley County, Ky., the river makes a sudden descent of sixty-three feet; below the falls the stream plunges over a series of rapids, the Great Shoals, for a distance of ten miles, descending to a level course between beautiful bluffs that gradually decrease in height. When conditions are favorable the Cumberland is navigable for light steamers carrying local products and merchandise as far as Burnside, Ky., 518 miles from its mouth, and steamers go to Nashville, a distance of 193 miles, throughout the year.

During the War of Secession the Confederates erected Fort Donelson on the Cumberland, and near-by, Fort Henry, on the Tennessee. The capture of these two forts in 1862 by Commander Foote and General Grant was one of the most important Union victories of the year.

CUMBERLAND ROAD, a government highway, called also the National Road, and known at first as the Great National Pike. It was projected in response to a demand for a better route from the East to the West, in view of

MAP OF THE CUMBERLAND ROAD

rapid settlement beyond the Ohio River. As finally built, it extended from Fort Cumberland, on the Maryland frontier, to Vandalia, Ill., a distance of 800 miles. As it was for many years the chief line of travel for thousands of Eastern settlers who were making their way westward, the Cumberland Road was an important factor in the development of the West and Southwest. The original plan was to construct the road from funds obtained by the sales of public lands in the states through which it passed, but it soon became necessary to call on Congress for additional appropriations, and between 1806, the year in which construction work began, and 1838 there were voted sums amounting to $6,821,246.

It was largely due to the efforts of Henry Clay that Congress advanced this money, and

in recognition of his services a monument to him has been erected on the road near Wheeling, W. Va. Because of the increasing importance of the railroads in stimulating westward immigration, construction work on the government highway was stopped in 1840. Each of the various states through which it passed was eventually given control of that portion of the road included within it.

CUM'MINS, ALBERT BAIRD (1850-), an American lawyer and political leader, one of the leading progressive members of the Republican party, three times governor of Iowa and since 1908 United States Senator from that state. Cummins was born on February 15, 1850, at Carmichaels, Pa. After a schooling at the academy in the neighboring town of Waynesburg, he studied surveying and became a railroad civil engineer. He later studied law, was admitted to the bar of Illinois in 1875 and practiced in Chicago for three years. In Des Moines, which became his home in 1878, he was soon conspicuous as a Republican orator and campaign organizer. He was Presidential elector-at-large, chairman of the Republican state convention and delegate to the national convention in 1892, and thereafter was conspicuous at nearly every state and national convention of his party. He was several times considered as a candidate for Vice-President, and in 1912 sought the nomination for President. He refused to leave the Republican party in that year, although he was in general sympathy with the Progressive party and opposed the methods by which President Taft was renominated.

ALBERT B. CUMMINS

Cummins first became a national figure about 1900, as the chief sponsor of the "Iowa idea," which called for a reduction in the existing high tariffs. In Iowa he was the leader of the progressive Republicans who opposed the Conservatives led by Senator William B. Allison. In 1902, 1904, 1906 and again in 1908 he was elected governor, but resigned a month before the end of his third term in order to become United States Senator, filling out the unexpired term of Senator Allison. He made a thorough study of railroad regulation and the control of other corporations, and his terms as governor were noteworthy for advanced trust legislation. In the Senate he became one of the leaders of a steadily-growing number who sought and secured progressive legislation.

CUNEIFORM, *ku ne' i form,* **INSCRIPTIONS,** the name given to the wedge-shaped characters used in one of the earliest forms of writing known to man. *Cuneiform* is from the Latin word *cuneus,* meaning *a wedge.* This system of writing originated in Babylonia at a remote and unknown date, and was invented by a primitive race of people called Sumerians, who developed it from a crude form of picture-writing. From stone they turned to clay as a writing material, using a sharp-pointed instrument, or *stylus,* which was triangular in shape, and which made wedgelike impressions in the soft clay. In this way cuneiform characters originated. Adopted by the Semitic Babylonians about 4500 B. C., cuneiform writing was taken over by the Assyrians and other peoples of Western Asia and by the Egyptians, and was in use until the first century before the Christian Era. The inscriptions were made both on clay tablets and on stone.

MEANING	Outline Character 4500 B.C.	Cuneiform 2500 B.C.	Assyrian 700 B.C.	Babylonian 500 B.C.
The sun				
God, heaven				
Mountain				
Man				
Ox				
Fish				

EXAMPLES OF CUNEIFORM WRITING

Each sign employed consists of a wedge or a combination of wedges written from left to right. The wedge points to the right, downwards or aslant, and sometimes two are joined to form an angle. Cuneiform writing is difficult to translate, because a character may represent a whole syllable or a word, and the system is therefore extremely complicated. Of the various forms of this writing the Persian is the simplest, because each sign stands either for a word or for a consonant and a vowel. The Assyro-Babylonian system is the most

CUNEIFORM CHARACTERS

The above, translated, reads: "She put me in a basket of rushes; with pitch my door she shut."

complicated and also the most important, because of what it has revealed to the modern world of the history of the ancients, and especially of peoples mentioned in the Bible.

Though Herodotus, Plutarch and other ancient writers referred to cuneiform texts, they seem to have passed out of the remembrance of man until the fifteenth century, when European travelers became interested in the famous inscription of Darius, carved 300 feet above the ground on the steep side of Behistun Rock, in Western Persia. On this lofty cliff Darius had recorded his achievements in three languages, Persian, Susian and Babylonian. The deciphering of the Persian text was begun in 1802 by a German scholar, Georg Grotefend, who succeeded in making out the name Darius. In 1838 Sir Henry Rawlinson made an epoch-making translation of a considerable portion of the Persian inscription, and six years later the translation of the Susian text was begun by Westergaard. Other scholars, including Rawlinson, succeeded in interpreting the Babylonian inscriptions, and since then marked progress has been made in this field of investigation. There are, however, thousands of cuneiform texts yet to be deciphered. B.M.W.

CUPID, *ku'pid,* the god of love of classic mythology, represented in sculpture and painting as a beautiful, chubby, naked boy with gauzy wings and a roguish, dimpled face, and armed with a bow and a quiver of arrows. No other character of mythology has been adopted more generally into the literature and sentiment of the present day. Frequently mentioned as *Dan Cupid,* this "archer of archers" is usually spoken of as blind or blindfolded. Shakespeare in *Midsummer Night's Dream* says:

"Love looks not with the eyes, but with the mind;
And therefore is winged Cupid painted blind."

Cupid was the son of Mars, god of war, and of Venus, the goddess of love. The legend is that he loved a mortal princess named Psyche, who after many trials was made immortal by the gods. As Cupid is the emblem of the heart, Psyche is the symbol of the soul.

Long ago Cupid was at times represented with a helmet, a spear and a buckler, and riding on the back of a lion or on a dolphin, to show his power. The Greek *Eros* is identified with Cupid as the god of love. See PSYCHE.

CUPOLA, *ku'po la,* a word derived from the Latin *cupula,* meaning a *little bowl,* or *cup.* It is applied in architecture to a roof resembling an inverted bowl. The words *cupola* and *dome* are used synonymously, but they should be distinguished, for while a cupola is usually more or less inconspicuous, the term *dome* is applied to a large building, the roof of which could not be said to resemble a little cup. The term would not be applicable to the dome of the Capitol at Washington, for instance. Saint Paul's Cathedral, London, has one conspicuous dome and two cupolas, or smaller domes, covering portions of the building. The term *cupola* is also applied to a saucerlike turret beneath which guns are concealed in a fort.

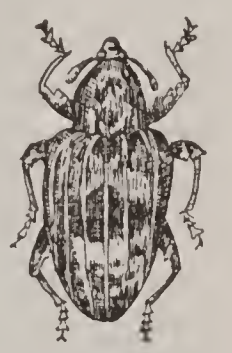
CURACAO, or **CURACOA,** *koo rah so',* or *koo rah sah' o,* one of the Dutch West Indies, in the Caribbean Sea, about forty miles north of Venezuela. Although small, covering an area of only 210 square miles, the island is commercially important and is the center of a thriving Dutch colony. The surface of Curacao is for the most part flat and of coral formation, though in the south there are volcanic hills rising to a height of 1,200 feet. Owing to lack of rain, agriculture is backward, but sugar, corn, fruits and tobacco are raised. The island is noted for a bitter orange from which a popular liquor is made (see below). The principal mining products are salt and phosphate of lime. The colony is administered by a governor, appointed by the Crown of the Netherlands, with headquarters at Willemstad, the capital. Population of the island in 1920, 32,709.

Curacao, a popular cordial or liquor prepared from the yellow rind of a bitter orange grown on the island of Curacao. It has an aromatic odor and a somewhat cloying, fruity taste. The rind is first steeped in alcohol, then distilled and mixed with syrup. The genuine curacao is much imitated, substitutes being prepared from ordinary oranges and colored by chemical processes.

CURASSOW, *ku'ra so,* or *ku ras' o,* a large handsome bird resembling the domestic fowl, a native of tropical America. The crested curassow of Guiana, Mexico and Brazil is best known. It is nearly as large as a turkey, but more striking in appearance. The plumage is black, with a purplish-green gloss above and

on the breast, the under parts being white. The golden crest feathers are curved forward and can be raised or lowered at will. Its strong bill is surrounded at the base with a skin in which nostrils are pierced. Curassows are easily domesticated and their flesh is good to eat. Large flocks are seen in branches of trees in South American forests, where they feed on nuts, berries and tender leaves.

CURCULIO, *kur ku' li o,* or **SNOUT BEETLE,** a family of 20,000 species of beetles, including some of the most destructive pests of nut and fruit orchards. The plum curculio is widely known as an enemy to plum, peach, apricot, cherry and apple crops. The rough, brownish beetles, with their long snouts and angled feelers, come from their winter home in the bark of trees or cracks in buildings when fruit trees commence to bloom. They then feed on the tender buds, blossoms and foliage. When fruit appears, the female beetle digs a hole in the pulp with her long beak, deposits an egg, presses it down with her snout and then cuts a crescent-shaped flap around the egg. There the egg hatches into a fat, whitish grub which feeds on the pulp, generally around the stone. In most cases "wormy" fruit falls from the tree when the grub is ready to develop into the pupa state, which is passed in the ground.



CURCULIO
About three times actual size.

Fruit which is infested with curculio grubs can be shaken from the tree together with mature beetles, and caught in a paper or cloth and destroyed. In that way a spread of the pest can be prevented. Spraying with arsenate of lead solution, two pounds to fifty gallons of water, will kill the beetles.

CURFEW, *kur' fu,* the ringing of a bell which, as Gray expressed it in his *Elegy,* "tolls the knell of parting day." The ringing of the curfew is a custom which originated as a protection against fire, but in modern usage tends toward reduction of crime and the protection of children. The ringing of curfew in a few American cities is at eight or nine o'clock. Through the success of a curfew ordinance introduced in Omaha, Neb., about 1880, similar rules have been adopted at various times by over 3,000 cities and towns of the United States, some remaining in force, however, for but a short period. After the ringing of curfew, children under fifteen years of age must not be on the streets without the written consent of parents or guardians, or unless accompanied by an adult. An improvement in the morals of children has resulted. Colonel Alexander Hogeland, who introduced the Omaha ordinance, has been called the father of the curfew law.

In England, the custom was introduced by William the Conqueror during the Middle Ages. At the ringing of the curfew the literal meaning of the French word, *to cover fire,* was observed, for all lights were extinguished and outdoor occupations ceased. In 1103 the law was repealed by Henry I, but the bell continued to be rung in many places and is still heard in small towns. That the custom was observed in England in the time of Cromwell is known from Rose Hartwick Thorpe's much-quoted poem, *Curfew Must Not Ring To-night.* It tells the thrilling story of a girl who saved her lover from death by swinging on the tongue of the church bell to prevent its sounding his doom. And when—

"It was o'er; the bell ceased swaying, and the maiden stepped once more
Firmly on the dark old ladder where for hundred years before
Human foot had not been planted. The brave deed that she had done
Should be told long ages after: as the rays of setting sun
Crimson all the sky with beauty, aged sires with heads of white,
Tell the eager, listening children,
"Curfew did not ring that night."

CURIE, *ku re',* PIERRE (1859-1906), and MARIE SKLODOWSKA (1867-), French scientists who by combined research discovered the wonderful medicinal properties of radium (which see). Professor Curie was born in Paris and was educated at the Sorbonne, where he later became professor of physics. His wife, whose fame is even greater, is of Polish descent, and was also educated in Paris. Their joint discovery of radium, announced in 1898, brought them immediate recognition from the scientific world. In 1903 they were awarded the Davy Medal of the Royal Society and one-half of the Nobel prize for that year for physics. Professor Curie died in 1906 but his

MADAME CURIE

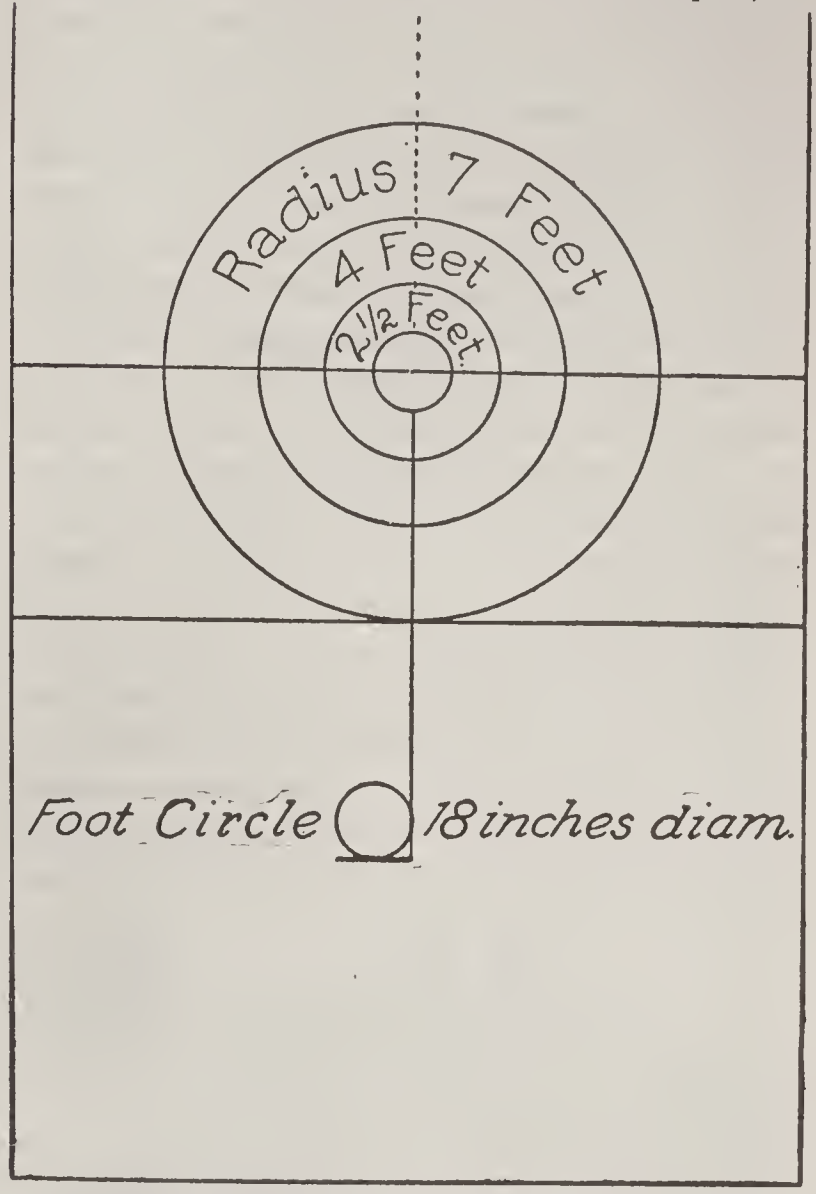
wife continued her researches. She succeeded her husband as professor of physics at the Sorbonne and in 1911 received the Nobel prize in chemistry. In 1921 she visited the United States, was enthusiastically received in scientific circles and presented with $100,000 worth of radium.

CURLEW, *kur'lu,* a genus of long-legged birds with long, slender, downward-curved bills, found throughout almost all the world. In the Americas several species are seen the year round, from Patagonia to Arctic regions. The

THE CURLEW

most common, known as the *long-billed curlew,* is about twenty-four inches long, including its slender, eight-inch bill, with which it drags small crabs and shellfish from wet sands, and snails and worms from the ground. On the prairies it snatches grasshoppers, beetles and berries. Its plumage is pale brown or buff above, mottled with black and dark brown, and nearly white below. The limbs are slender and partly naked; the tail is short and rounded. Curlews of the interior are valued for their flesh and eggs.

CURLING, *kurl'ing,* a game played on the ice, one of the few amusements concerning the origin of which there is no doubt. It has been popular in Scotland for more than three centuries and has been adopted in Canada and the United States; in Canada, especially, it has become a national winter sport. The game has increased so much in favor that international matches are annually played between Canada and the United States. A *bonspiel,* as

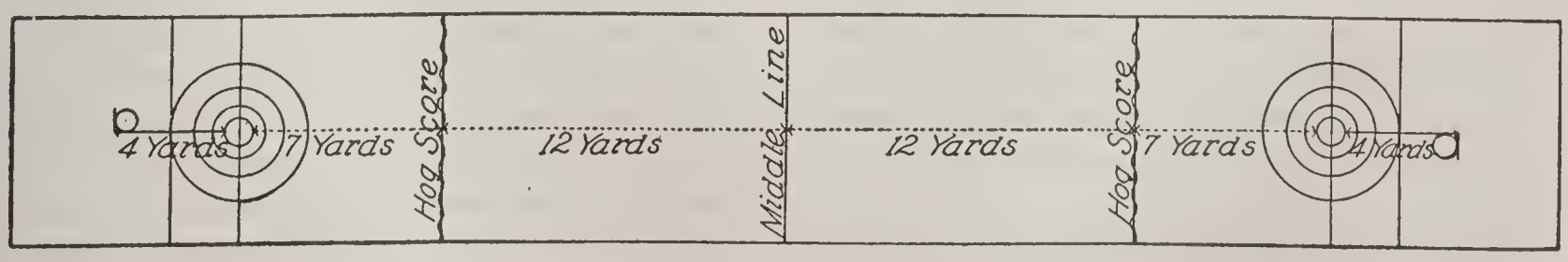


ENLARGED END OF FIELD

POSITION FOR DELIVERY

a curling tournament is called, is the chief winter attraction in many Canadian cities.

The game is played on a rink marked out on



FIELD MEASUREMENTS

the ice, with large, smooth stones to which handles are fixed. It might be called bowls on ice, as the rules and methods of curling are quite similar to those governing the game of bowls. The stones weigh from thirty to forty-five pounds. There are usually four players on a side, or team. Each player uses two stones, which he slides along the ice towards a mark forty-two yards distant. The object is for a player to lay his stones closer to the mark than those of his opponents. After all players have "curled," or played, the side having stones nearest the mark scores a point for each stone so placed. In Canada and the United States iron curlers are sometimes used instead of stones. W.C.

See Spalding's *Guide to Curling,* for complete rules governing players.

CURRANT, *kur'ant,* a small, smooth, tart berry, cultivated in gardens in all temperate regions except in Africa. The bush on which it grows has slender branches bearing small, broad leaves, which shield first the greenish

THE CURRANT
Branch, fruit and cross section of fruit.

flowers from the sun, then the grapelike bunches of pea-sized globes of red, black or white fruit. Red currants, although used as dessert fruit, are most popular for jams, jellies and pies. White currants, similarly used, are a cultivated variety of the red. In the United States the currant crops of commerce are produced chiefly in the Middle Atlantic and East North Central states, the average annual crop being about 11,000,000 quarts, valued at nearly $800,000, New York state producing about one-third of the crop. The province of Ontario produces a good crop.

Black currants have a stronger taste and odor than the red and the white, and are valued for wine making and for their supposed medicinal qualities in throat troubles and as a tonic. They are little grown in the United States, but are very abundant in Canada and Europe.

A number of species of currant are valued for ornament. Most currant bushes are grown from cuttings six to ten inches long. Strong, moist loam in a cool location is the most favorable, and although currants are hardy and thrive even if neglected, frequent cultivation, enriching of the soil and pruning will be rewarded by larger berries and greater quantities. Various diseases to which currant bushes are subject can be prevented by use of a fungicide; the currant worm, one of the most serious pests of the shrub, can be effectively removed by sprinkling with a solution of one teaspoonful of powdered hellebore to a gallon of water.

The name *currant* was derived from ancient Corinth, in Greece, the city from which great quantities of a seedless raisin called currant were originally sent. See RAISINS.

CURRENCY. This subject is treated in the article MONEY.

CURRENT, ELECTRIC, the flow of electric energy from one body to another. The amount of electric energy that a charged body contains is its *electric potential.* When two bodies are unevenly charged, one has a higher potential than the other. If these bodies are connected by a conductor the electric energy will flow from the higher to the lower potential and this flow will continue until the potentials of the bodies are equalized. The force which causes the flow is called the *electromotive force* (which see), and it is likened to the pressure which causes the flow of water through a pipe. In order that the current may continue it is necessary that the supply of electric energy also be continuous. The simplest device for producing an electric current is the voltaic cell (see ELECTRIC BATTERY). In this cell the chemical action at one plate is greater than that at the other; hence the potential of one plate is higher than that of the other. If these plates are connected by a copper wire so as to complete the circuit, a current will flow from one to the other and the current will continue until the chemical power in the cell is exhausted. If the wires are separated the circuit is broken and the current stops, unless it is strong enough to leap over the gap. When this occurs a spark is formed.

Air, rubber, glass, mica, dry wood and other substances will stop the current, and are known *as non-conductors* or *insulators.* Both conductors and insulators are necessary to the flow of a current between the desired points, as between the battery and the telegraph instrument, for if the line wires were not supported

on insulators most of the current would flow to the ground along the poles and be lost. Sometimes wires carrying the current for operating electric motors, as on street car lines, are incased in rubber to prevent loss by the air, which at all times takes some energy from the conductor.

According to the method of generating them electric currents are of two classes, direct and alternating.

Direct Current. A direct current is one that flows continuously in the same direction, like that produced by an electric battery. The direct current is used for ringing electric bells, in experiments in the laboratory and in operating electric motors where great power is required in starting and frequent variation of speed is necessary, as on electric cars.

Alternating Current. An alternating current is one whose direction is rapidly reversed by the use of a magnet. If a magnet is placed in a coil of wire along which an electric current is flowing, the current is reversed. When the magnet is withdrawn, the current again flows in its original direction. The same effect is produced whether a permanent or an electric magnet is used. Many devices have been invented for the purpose of reversing the current, but the one in most common use is the revolving electromagnet which causes the reversal by reversing its poles. The alternating current is used for electric lighting and for electric motors where a uniform rate of speed is required. See ELECTRICITY; ELECTROMAGNET; ELECTROMAGNETISM; ELECTRIC MOTOR.

CURRENTS, OCEAN. See OCEAN CURRENTS.

CURRIE, ARTHUR W., Sir (1875-), commander of the Canadian forces in Europe in the War of the Nations (which see). He was born in Middlesex County, Ontario; his education was obtained in the local schools and in the Strathroy Collegiate Institute. After graduation he taught school in British Columbia for several years, then entered the insurance and real estate business in that province.

His miltary career began in 1895, when he became a private in the First Regiment of the Canadian Garrison Artillery of British Columbia. Here he rose to the rank of lieutenant-colonel, and was transferred in 1913 to the Fiftieth Gordon Highlanders of Canada, at Victoria. In the first week of the War of the Nations he enlisted for European service, reported at Camp Valcartier, Quebec, with his regiment, was commissioned a brigadier-general and was sent to Northern France. His brigade won undying fame at the second battle of Ypres, in April, 1915. Five months later he was made commander of the First Canadian division of overseas troops. In June, 1917, Currie was made commander of all Canadian forces in Europe. His divisions were continually in desperate fighting which marked them as among the stubbornest soldiers the Germans ever faced. He was made a Companion of the Order of the Bath by His Majesty, George V; France honored him with the decoration Croix de Commandeur and enrolled him Commandeur in the Legion of Honor. In 1920 he was offered the presidency of McGill University.

CURTIS, GEORGE WILLIAM (1824-1892), an American essayist, editor and lecturer who was one of the best-loved and most highly-respected public men of his time. He was born in Providence, R. I. At the age of eighteen he found himself interested in the Transcendental movement (see TRANSCENDENTALISM), and for two years lived at Brook Farm (which see). After spending a few years in European and Eastern travel, Curtis returned home in 1850 and began a brilliant career in New York City. He became associate editor of *Putnam's Magazine,* and for this periodical and for *Harper's Monthly* wrote a large number of essays that at once struck the popular fancy. The most important collections of his essays are the *Potiphar Papers,* gently satirizing the fashionable society of his time, and *Prue and I,* a study of life in which humor, tenderness and sentiment are pleasingly blended. "The Editor's Easy Chair," which he created for *Harper's Monthly,* was for years one of the most popular departments of that periodical.

Curtis became political editor of *Harper's Weekly* in 1863, and made that journal a powerful force in shaping public opinion during the War of Secession and after its close. He was one of the founders of the Republican party and one of its most influential leaders until 1884, when he became an independent in politics. In the advancement of civil service reform he was long a conspicuous figure, and the report which he wrote as chairman of the civil service commission, in 1871, has been the basis of later efforts to extend and purify the service.

CURTISS, GLENN HAMMOND (1878-), the inventor of the flying boat, an American whose name stands next to that of the Wright brothers in the list of famous contributors to the science of air navigation (see FLYING MACHINE). He holds many patents for biplane

devices and has received a medal from the Smithsonian Institution and others from the Aero Club of America.

A boyhood interest in bicycle racing led to Curtiss's flying career. After winning a number of contests with the old-style pedal bicycle he invented a motor-cycle, on which in 1906 he traveled a mile in 26⅖ seconds, a speed of over 136 miles per hour, the fastest up to that time traveled by man. Success in building light but powerful motors induced him to try aeroplaning. In 1906 he won the *Scientific American* trophy for a flight of over a mile; in 1909, the Gordon Bennett cup for a flight at Rheims, France, at a speed of nearly forty-seven miles an hour, and in 1910 a $10,000 prize for a flight from New York to Albany, 142 miles, with only three stops. He then turned his attention to the manufacture of aeroplanes and the development of flying boats. In 1914 he made a flight in the famous Langley machine, built in 1903 before the first Wright fliers, but never before successfully operated. See WRIGHT, ORVILLE and WILBUR; LANGLEY, S. P.

CURVE, *kurv,* a line no portion of which is straight. A continuous uniformly-curved line is called a circle (which see). Aside from its important place in higher mathematics, too technical for discussion here, the term *curve* has various applications and meanings. Such expressions as "the railway curve" or "the curve of the winding road" are familiar; this idea is poetically expressed by Tennyson in the often-quoted lines from *The Song of the Brook:*

> With many a *curve* my banks I fret
> By many a field and fallow.

Curved lines are widely used in text-books and official reports to represent variations in temperature, population, rainfall, etc. In base-ball, the term is used in connection with a ball so thrown that its course is a curve which varies from that ordinarily taken, the variation being due to a peculiar rotation of the ball and the resisting power of the air.

CURZON, *kur'zon,* GEORGE NATHANIEL, Lord (1859-), an English statesman who, as Viceroy of India, materially assisted in consolidating the Indian Empire and gained a reputation for diplomacy of a high order. He was educated at Eton and Oxford and later became private secretary to Lord Salisbury. He was elected to Parliament as member for Southport, Lancashire, and held his seat for twelve years. In 1895 he married Mary Victoria Leiter, daughter of a wealthy Chicago merchant. In 1899 he was appointed Viceroy of India, a position he retained until 1905. He endeavored to conciliate the natives of India, but showed firmness in his dealings with them. He took a keen interest in educational movements, and was instrumental in greatly increasing the numbers of available teachers and of schools. He viewed with distrust the growth of Russian influence in the East and urged strong military preparations to check Russia's designs. A disagreement with Lord Kitchener on military matters led to his resignation, and on returning to England he was made a peer and took his place in the House of Lords. His works, *Persia and the Persian Question, Russia in Central Asia* and *Problems of the Far East,* are regarded as authoritative.

In 1916 he married again. In 1919 he assumed an important post in the Lloyd George Cabinet.

CUSHMAN, CHARLOTTE SAUNDERS (1816-1876), one of the greatest tragic actresses of America, the first member of the theatrical profession whose name has been placed in the Hall of Fame (which see). This honor was accorded her in 1915. She was born in Boston. Possessing a fine contralto voice, she began when a young girl to study for the operatic stage, but after straining her voice in singing high rôles she devoted herself to drama. In 1835 she appeared as *Lady Macbeth,* always one of her greatest rôles. She also won praise for her interpretation of the part of Meg Merrilies, in Scott's *Guy Mannering.* Although she occasionally played in high comedy, Miss Cushman was best known as a tragedienne. She had immediate success in both London and Dublin, and remained abroad for several years. The latter part of her life she spent in America, and on her last appearance on the stage, in New York City, November, 1874, she was presented with a laurel crown, William Cullen Bryant acting as spokesman.

CUS'TER, GEORGE ARMSTRONG (1839-1876), an American soldier whose story is one of wild life on the plains and of bloody Indian warfare in the service of his country. He was born at New Rumley, Ohio. After graduating from West Point, at the outbreak of the War of Secession he was given a commission in a cavalry regiment. Carrying dispatches from Washington to General McDowell, he arrived at the front just in time to take part in the first Battle of Bull Run. He was appointed aid-de-camp to General McClellan, who was

impressed by Custer's energy and bravery. The first colors captured by the Union army were taken by Captain Custer. By 1863 he had gained the rank of major and later became major-general of volunteers.

From 1866 to the time of his death he was known as *Yellow Hair,* a fighter of Indians on the plains of Montana and Dakota. His last battle was fought in June, 1876, when he with his whole command was defeated and massacred on the Little Big Horn, by the Sioux under Sitting Bull. The spot has been made a national cemetery, and places in Montana and in the Black Hills of South Dakota, as well as in a number of other states, are named for him. In Longfellow's poem, *The Revenge of Rain-in-the-Face,* the story of Custer's last battle is told. He was buried at West Point, where a statue was erected in his honor.

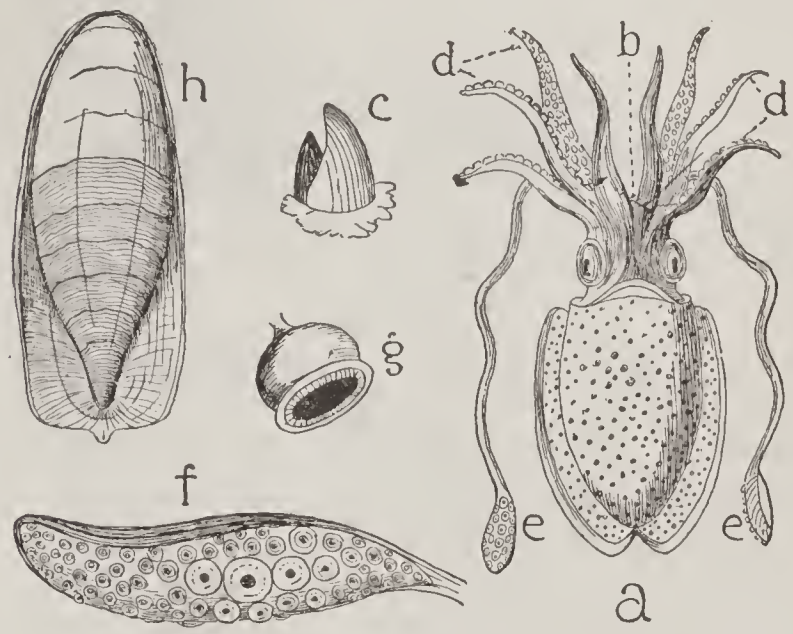
CUS'TIS, George Washington Parke (1781-1857), the adopted son of George Washington and grandson of Martha Washington, and an author of several plays. It was he who erected the Arlington mansion on the site of the present Arlington National Cemetery, once the home of Robert E. Lee through the latter's marriage with the daughter of Custis. Custis is best known for his publication of *Recollections of Washington.*

CUSTOMS DUTIES. If you enter the city of Rome from any other part of Italy inspectors will examine your baggage and perhaps exact a tax upon certain goods which you are bringing in. There was a time when nearly all cities observed the custom of so taxing their commerce, and that is probably why taxes on imports and exports came to be known as *customs* duties. Nowadays they are generally levied only on international trade; in the United States, in fact, the Constitution expressly provides that "no state shall . . . lay any imposts or duties on imports or exports." The same Constitution rules that "no tax or duty shall be laid on articles exported," but there are a few nations which do have export duties. Brazil and Haiti, for instance, collect money on all coffee sent abroad.

Not all countries have the same reason for maintaining customs duties. England, called a *free trade* country, taxes only such imports as liquors, tobacco, tea and sugar, and does it solely to gain revenue. Canada, on the other hand, provides duties on all sorts of manufactured goods and farm products, so that Canadian producers will have an advantage over foreign merchants. See Tariff.

If customs charges are based on the *quantity* of imports, the duties are said to be *specific;* if according to the *value* of imports, they are described by the Latin phrase *ad valorem,* meaning *according to value.* Specific duties are apt to favor producers of cheap goods. Thus, if foreign baking powder is taxed six cents a pound, the grade worth twenty-five cents bears a charge of nearly one-fourth its price, while that worth fifty cents has a duty of less than one-eighth, and home manufacturers of the cheaper grade will meet less foreign competition. *Ad valorem* duties, if correctly calculated, avoid this injustice, but because of the tendency of importers to understate values they are difficult to apply. Sometimes imports are charged with a combination of *ad valorem* and specific rates.

CUTTLEFISH, *kut''l fish,* a shellfish whose internal shell is the broad, spongy, chalky *cuttlebone,* used by cage birds to sharpen their beaks, also in powdered form by people, to clean their teeth. The cuttlefish is important,



CUTTLEFISH

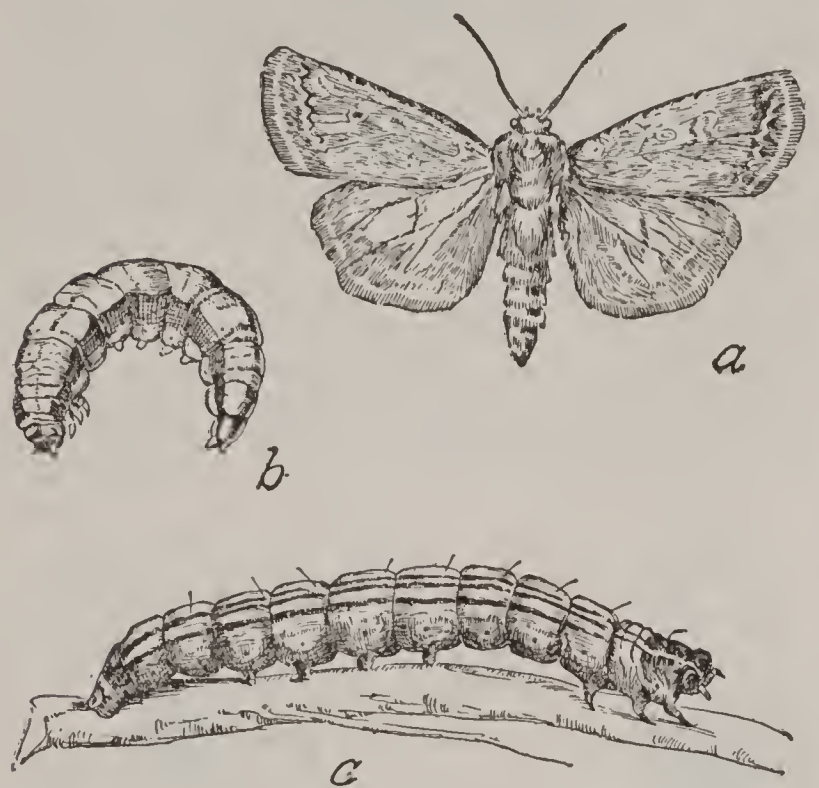
(*a*) General view; (*b*) location of mouth; (*c*) mouth; (*d*) arms, with suckers; (*e*) tentacle with suckers on end; (*f*) end of tentacle, showing suckers; (*g*) one of the suckers; (*h*) interior shell, called *cuttlebone.*

too, for the production of the pigment sepia (which see), an inky substance which it expels when alarmed, so darkening the water and making possible its escape.

Cuttlefish are found in all seas, usually in deep water but occasionally near shore. They are commonly about nine inches long, but some are as long as seven feet. Their bodies are brown, cross-banded and spotted with purple, showing brilliantly metallic in sunlight, or changing color at will. Eight short arms and two long tentacles, all bearing four rows of horny-rimmed suckers, surround the mouth. The tentacles can be drawn into pockets behind

the eyes. The arms are used to catch shellfish food, or to attach the animal to various objects. In the broad head are two large eyes. A frilled fin edges the oval body. By drawing in or forcing out jets of water from a funnel, cuttlefish are enabled to move backward or forward.

CUT'WORM, a greasy, dull-brown or gray caterpillar pest of gardens, fields and orchards, the larva (young) of a yellowish or pearl-gray night moth. This destructive worm hides in the ground by day and at night comes forth to



CUTWORM

(*a*, *b*) Moth and larva of one common species; (*c*) larva of another species. About actual size.

feed. It cuts off young plants at the level of the ground, destroying more than it eats. Little armies of cutworms have been known to destroy entire fields of young wheat, Indian corn or garden vegetables over night. They also attack tobacco, cotton and leaves and buds of fruit trees. Treatment with poison sprays is effective in destroying these pests. An excellent preventive consists in sprinkling the ground with poisoned branmash before the plants come above the ground, for cutworms will eat a mixture of Paris green, bran, and sugar-sweetened water in preference to vegetation.

CUVIER, *ku vya',* Georges Léopold Chrétien Frédéric Dagobert, Baron (1769-1832), one of the greatest naturalists the world has produced, was born at Montbeliard, France. After finishing his education at Stuttgart he accepted a situation as tutor in Normandy. Several theses on zoölogical topics established his reputation and procured him admission to the learned societies of Paris. In 1802 he succeeded to the chair of comparative anatomy at the Jardin des Plantes (botanical and zoölogical garden), and devoted himself to the studies which have perpetuated his name. His great book on the animal kingdom *(Le Règne Animal)* was for a long time the highest authority on zoölogy; this and many other works raised him to the pinnacle of scientific fame. Cuvier filled many offices of importance, particularly those connected with educational institutions. Napoleon treated him with much consideration, and Louis Philippe raised him to the rank of a peer of the realm. He died suddenly of paralysis in Paris.

CUZCO, *koos'ko,* a city far inland in South Central Peru, the capital of a department, or state, of the same name, situated in the center of a fertile agricultural district in the Andes. It is 11,300 feet above sea level, and although only 12° south of the equator, has a mild and inviting climate. Important manufacturers of woolen and cotton goods, sugar, embroidery and leather are carried on and there is extensive island commerce. Cuzco is one of South America's oldest cities, founded in the eleventh century, and at one time was the capital of the empire of the Incas (see Inca). The ancient city was stormed and destroyed by Pizarro in 1535, but remains of its former glory are seen in the palace of the Incas and a mighty Temple of the Sun, the object of their worship. The modern city is well built and contains many handsome buildings. Population, believed to be not over 15,000.

CYANOGEN, *si an'o jen,* a colorless gas formed by the union of carbon and nitrogen. It has the odor of peach pits and burns with a purplish flame. It is valuable only for its compounds. A compound of cyanogen with a metallic element is called a *cyanide.* When a cyanide is heated with sulphuric acid the deadly poison *prussic acid* is formed. *Potassium cyanide,* the most important compound, is used in large quantities in the "cyanide process" of extracting gold from its ores. See Gold.

CYCADS, *si' kadz,* a family of large tropical and sub-tropical naked-seeded plants (gymnosperms) of palm- or fern-like appearance and habits. As they bear cones, however, they are more nearly related to pines than to the palms. Fossil remains show that such plants, with their columnlike stems topped with rosettes of feathery, fernlike leaves and huge cones, were once very abundant everywhere, but they are found only in small areas at present. One species, however, is still almost as thick as

weeds in Southern Florida. The stems of some cycads are like large tubers, almost or entirely underground. Cycad stems store immense quantities of starch, for which they are collected in some countries for the production of *sago* (which see). That has caused the tree to be incorrectly called *sago palm,* but the sago of commerce is obtained from a true palm.

CYCLADES, *sik'la deez,* a group of islands in the Aegean Sea, southeast of Greece, to which country they belong. The principal islands are Andros, Paros, Naxos, Rhenea, Syra and Delos, some of them famous in ancient myths and story. The name is derived from the Greek *kyklos,* meaning a *circle,* and was given to the islands because they are supposed to form a protecting circle around the sacred island of Delos. The soil is naturally fertile, but lack of water is a serious handicap to agriculture. Fishing is the principal occupation of the inhabitants, though olives and grapes are grown in considerable quantities. The chief source of revenue lies in valuable deposits of building stone, which is extensively quarried. The commercial center is Hermopolis, a town with a good harbor, on the island of Syra. Population, 1920, 120,292.

CYCLAMEN, *sik'la men,* a genus of handsome, winter-blooming, tuberous-rooted plants of the primrose family, natives of Europe and

CYCLAMEN

Asia, but cultivated in homes and greenhouses in America. The flowers are scentless, with white, rose-colored or purple petals turned backward as if the flowers had been turned inside out. The latter are from two to two and a half inches long and droop downward on their stems. The leaves are large, heart-shaped, glossy and of varying tints. Although usually purchased in pots already flowering, with a little care the cyclamen can be raised from seed in a light, rich soil. While the seeds are germinating a temperature of 50° to 60° F. and plenty of water are required.

In Southern Europe the turniplike, bitter, partly underground stems of the cyclamen are relished by swine.

CYCLONE, *si'klohn,* in physical geography, is the name applied to a form of atmospheric disturbance in which there is a central area

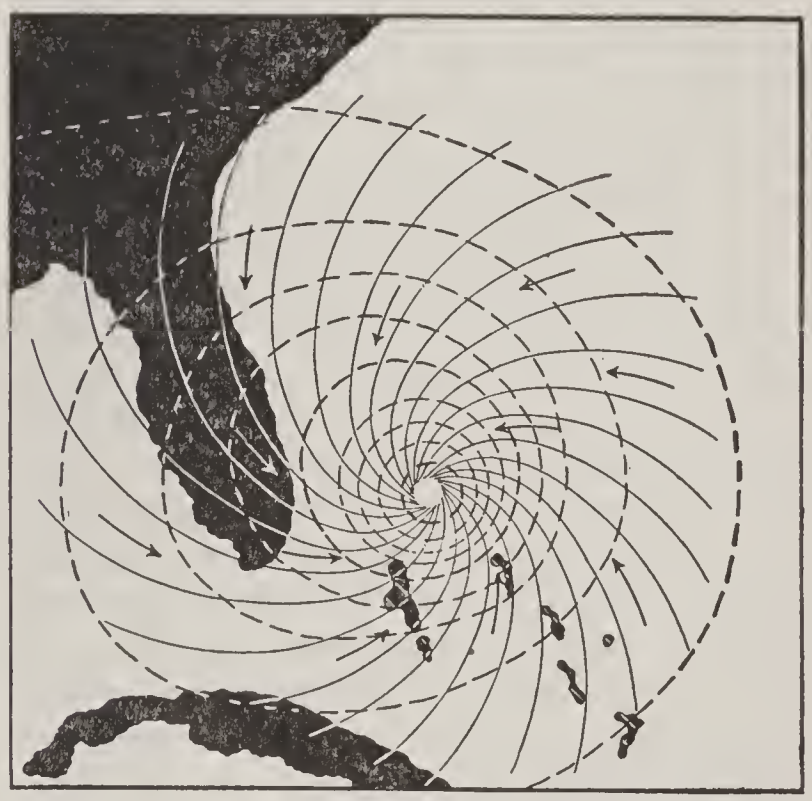


DIAGRAM OF FIELD OF ACTION

The solid, converging lines indicate motion of the wind; the dotted lines, the general path of the storm.

of atmospheric pressure lower than that of surrounding areas, with the wind blowing spirally around and in toward this center. According to popular usage a *cyclone* is a violent revolving windstorm that occurs with more or less frequency in the Mississippi Valley and causes great destruction of life and property, but such storms are properly called *tornadoes.* The destructive storms that periodically sweep over the West Indies, known as *hurricanes,* are sometimes called the *cyclones of the tropics.* Tornadoes and hurricanes, together with the *whirlwind,* which varies in magnitude from an eddy of dust in the street to a storm as violent as a tornado, are all classed as *cyclonic storms.* The term *cyclone* therefore is general, and a cyclonic disturbance may be a mild rainstorm or a devastating gale.

Cyclones are caused by local differences in

temperature, and they originate in areas that have low atmospheric pressure. In the vertical system of atmospheric circulation the surface air, which is warmed by the heat radiated from the earth, is constantly ascending, while the colder air above is constantly descending. When in any locality there is a period of calm this vertical circulation of the air is arrested, and the result is a condition of unstable equilibrium. In other words, a heavy stationary layer of cold air overlies a surface layer of warm light air. When finally the air is set in motion by a current from without, the cold air rushes downward and there is an inflow from all the surrounding areas. This inflow moves in a spiral direction, with a gradual increase of intensity, and when it reaches the upper regions of the air the moisture is condensed, clouds form and rain often falls. The cyclonic disturbance has two movements—the *rotating whirl* toward the center of low pressure and the *forward movement* of the entire storm.

Nearly all land storms are of a cyclonic nature, but many of them are so mild that their rotary motion is not noticed by any except trained observers of the Weather Bureau. These storms travel in the direction of the prevailing winds; the spiral whirl of cyclones in the northern hemisphere moves in the opposite direction from that of the hands of the clock, and in the southern hemisphere in the reverse direction. North of the equator the movement is first toward the northwest and then toward the northeast. In the southern hemisphere it is southwest, then southeast. The corresponding movements towards centers of high pressure, in which the currents of air flow spirally from the central area outward, are called *anticyclones.* The central area of an anticyclone is an area of clear skies and fair weather.

Related Subjects. The following articles in these volumes will make more clear the general principle of a cyclonic disturbance and the distinction between various types:

Barometer	Tornado
Hurricane	Typhoon
Storms	Whirlwind

See, also, WIND, and the topics listed there.

CYCLOPES, *si klo′peez,* in Grecian legend, a race of giant shepherds. Each had only one eye, which was placed in the middle of the forehead. These giants dwelt in Sicily. In the story of Hesiod they were the sons of Uranus and Gaea, or Heaven and Earth, and were slain by Apollo for having furnished Zeus with thunderbolts to kill Asclepius. See MYTHOLOGY.

CYLINDER, *sil′in der.* A circular solid having the same diameter throughout its length, and having as its ends two equal parallel circles, is called a *cylinder.* These circles are called the *bases* of the cylinder; the distance between the bases is the *altitude* (*a-a*) of the cylinder; the curving surface is called its *lateral,* or *convex,* surface (Fig. 1).

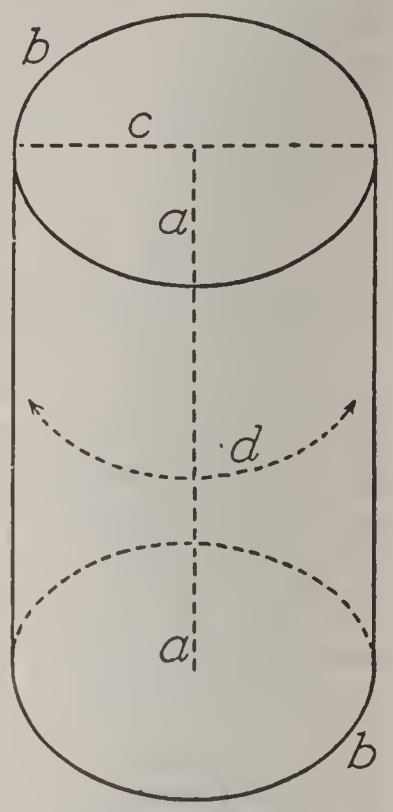


FIG. 1
(*a-a*) Altitude; (*b*) perimeter of base; (*c*) diameter of base; (*d*) lateral surface of cylinder.

We see this figure in water pipes, gas pipes, logs, iron rods, tin vegetable cans, water tanks and so forth.

From a rectangular piece of tin or paper six inches long and four inches wide you can make a cylinder six inches in circumference and four inches high, allowing no material for a lap (Fig. 2). From this it is seen that the lateral surface of a cylinder is equal in area to a rectangle whose length is equal to the circumference of the cylinder and whose width is equal to the altitude of the cylinder.

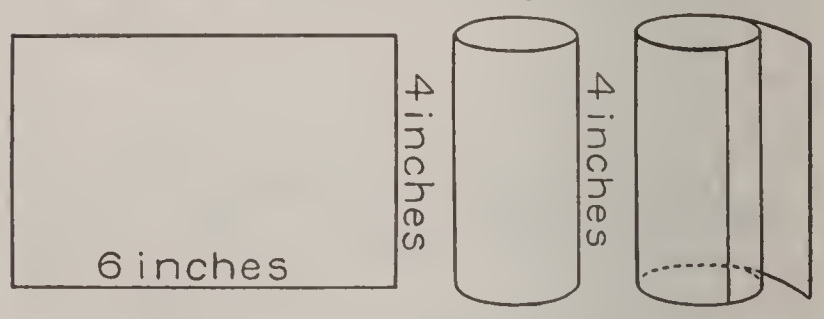


FIG. 2
Showing the relation between the area of the lateral surface and that of a rectangle of similar dimensions.

Therefore we have this law: *Area of lateral surface of a cylinder is the product of the circumference and the altitude* when these two dimensions are expressed in the same linear units. For example: Find the lateral surface of a water pipe whose circumference is 30 inches, and whose length is 20 feet. Solution: lateral surface in square feet=20×2½=50, or lateral surface in square inches=240×30=7200.

If we know the diameter or radius, and the altitude of a cylinder, to find its lateral surface, we first find the circumference and proceed as before. Circumference equals 3.1416 ×diameter or 2×3.1416×radius (see CIRCLE). For example: Find how many square inches of tin in the lateral surface of a can 3 inches in

radius and 10 inches high. The solution follows:

Circumference of a circle $=2\times3.1416\times$radius.
Circumference of can in sq. in. $=2\times3.1416\times3=18.8496$.
Lateral surface in sq. in. $=10\times18.8496=188.496$.

How many square inches of tin will be required for the entire can? The bases are circles; therefore the area of each base equals $3.1416\times\text{radius}^2$ (see CIRCLE).

Area of 2 bases in sq. in. $=(3.1416\times3^2)\times2=56.5488$.
Lateral surface in sq. in. $=188.496$.
Entire surface in sq. in. $=245.0448$ (sum of 56.5488 and 188.496).

The volume of a cylinder equals the product of the area of one base and the altitude; expressed more concisely:

Volume of cylinder $=3.1416\times\text{radius}^2\times$altitude.

The number of cubic inches in the above can is found as follows:

Radius $=3$ in.
Altitude $=10$ in.
Volume in cu. in. $=3.1416\times3^2\times10=282.744$.

Practical Problems. A well is 30 feet deep and 4 feet in diameter. How many gallons of water will it hold?

We see that the well is a cylinder. The base is a circle whose radius is 2 feet, and the depth of well, 30 feet, is the altitude of the cylinder. The solution is as follows:

Area of base in sq. ft. $=3.1416\times2^2=12.5664$.
Volume in cu. ft. $=12.5664\times30=376.992$.
1 cu. ft. $=1728$ cu. in.
376.992 cu. ft. $=376.992\times1728$ cu. in. $=651442.176$ cu. in.
231 cu. in. $=1$ gallon.
Number gal. in well $=651442.176\div231=2830.096$.

The solution may be shortened as below by cancellation:

Radius $=2$ ft.
Area of base in sq. ft. $=3.1416\times2^2=12.5664$.
Volume in cu. ft. $=12.5664\times30=376.992$.
231 cu. in. $=1$ gallon.
1728 cu. in. $=1$ ft.

$$\text{Number gallons in well}=\frac{\overset{4.896}{\cancel{34.272}}\quad\overset{576}{\cancel{1728}}}{\underset{77}{\cancel{231}}\;\underset{7}{\cancel{77}}}=2820.096$$

How many square inches are there in the lateral surface of a lead pencil which is one-fourth inch in diameter and six inches long?

Take a piece of paper 11½ inches wide and 20 inches long. Roll it to form a cylinder, using the ½ inch from 11½ inches to paste as a lap. What is the circumference of the cylinder? Find its diameter and radius.

The circumference $=3.1416\times$diameter. Therefore $11=3.1416\times$diameter. (For many practical problems we may use $3\frac{1}{7}$ instead of 3.1416.) Do so here and see that $11=3\frac{1}{7}\times$diameter; diameter

$$=11\div3\tfrac{1}{7}=\frac{11}{3\frac{1}{7}}=\frac{\overset{1}{\cancel{11}}}{1}\times\frac{7}{\underset{2}{\cancel{22}}}=3\tfrac{1}{2};\ \text{radius}=\tfrac{1}{2}\text{ of }3\tfrac{1}{2}=1\tfrac{3}{4}.$$

Find the area of the ends of your cylinder. Solution as follows:

Area of a circle $=3\frac{1}{7}\times\text{radius}^2$.
Area of 2 bases $=3\frac{1}{7}\times(1\frac{3}{4})^2\times2=$

$$\frac{\overset{11}{\cancel{22}}}{\underset{1}{\cancel{7}}}\times\frac{\overset{7}{\cancel{49}}}{\underset{4}{\cancel{16}}}\times\frac{\overset{1}{\cancel{2}}}{1}=\frac{77}{4}=19\tfrac{1}{4}.$$

Area of bases $=19\frac{1}{4}$ sq. in.

Second solution: We may use the fact that

$$\text{Area}=\frac{\text{radius}}{2}\times\text{circumference}.$$

Area of 1 base $=\frac{1\frac{3}{4}}{2}\times11=\frac{7}{4}\times\frac{1}{2}\times11=9\frac{5}{8}$.
Area of 2 bases $=2\times9\frac{5}{8}=19\frac{1}{4}$.
Area of bases $=19\frac{1}{4}$ sq. in.

How many cubic feet of water can be stored in a cylindrical reservoir 40 feet in radius and 60 feet high?

The volume of the cylinder is a problem which enters largely into the industrial world; for example, in the building of reservoirs, pipes and tanks for transporting oils, and in the construction of engines and machines of various kinds, a knowledge of the capacity of the cylinder is essential. A.H.

CYNIC, *sin'ik,* **SCHOOL OF PHILOSOPHY,** a system of Greek philosophy founded in the fourth century B. C. by Antisthenes, a disciple of Socrates. He took as his starting point the doctrine of his great teacher, that virtue and not pleasure is the chief end of life, and it alone constitutes true happiness. From this he argued that since continued happiness is not possible if man has wants and desires which may not be satisfied, virtue consists in living as much as possible unfettered by desires. Therefore, the wise man is the one who looks with indifference on all the ordinary pleasures of life and who lives for and in himself alone.

Among the enthusiastic followers of Antisthenes was Diogenes (which see), who carried the principles of the school to an extreme, living, it is said, on the coarsest bread and sleeping at night in a tub. Zeno and Demetrius, the latter of the later Roman period, were other distinguished Cynics. Though not of the greatest importance as a school of philosophers, the Cynics form the link between Soc-

rates and the more influential Stoics (see STOICISM).

Authorities differ as to the derivation of the name *Cynic,* some referring it to Cynosarges, the name of the building in Athens in which the Cynics first met, and some to the Greek word for *dog,* alluding to the rude manners of the members of the school. In modern usage the word *cynic* implies a sneering tendency to deny that goodness exists in human nature.

CYPRESS, *si pres,* a genus of somber, slow-growing, cone-bearing trees, most of which are evergreen and valued both for ornament and for lumber. They are natives of Western North America, Europe and Asia, growing chiefly

CYPRESS
Branch, leaves and cones.

in moist, warm climates, although also cultivated to some extent in dry places. The leaves are small, dark, sharp-pointed, placed in a comblike arrangement on the twigs. The flowers are tiny and yellowish. The cones are ball-like, with a few woody scales.

The best-known cypress is the *common cypress* of Southern Europe, which has been introduced into America and England. It is a dark, thickly-leafed, somewhat quadrangular tree which takes the form of a pyramid at the top. It reaches a great age, and its red or yellowish wood of pleasant odor is very durable, withstanding weather and insect pests. Its present use is chiefly for musical instruments and cabinet work. Such trees have long been used in cemeteries, and branches of cypress were formerly worn as emblems of mourning at funerals. The Monterey cypresses, gnarled, flat-topped, of grotesque shapes, are fine examples of this variety of trees.

The *bald cypress,* which sheds its leaves and is therefore deciduous, is one of the most valuable of timber trees (see DECIDUOUS TREES). It reaches a height of 150 feet in the swamps of the Southern United States. Where it grows to best advantage great forests cover many square miles. Its wood is soft, easily worked and durable, and is commonly used for shingles, ties, posts and interior finish. A peculiar feature of this tree is the development of knots, or *knees,* upon the roots at its spreading base. Such growths sometimes reach a height of ten feet. Small cypress knees are often hollowed and made into bowls and buckets.

The annual lumber cut of cypress in the United States amounts to nearly 1,000,000,000 board feet, valued at more than $20,000,000; Louisiana furnishes about two-thirds of the supply, and Florida is second, with ten per cent. Other states which cut over 25,000,000 feet annually are Georgia, Arkansas, North Carolina and South Carolina. M.S.

CYPRUS, *si'prus,* after Sicily and Sardinia the largest island in the Mediterranean Sea. It occupies 3,584 square miles in the northeast corner, forty miles from the coast of Asia Minor, and is nearly three times the size of Rhode Island. Mountain ranges border its north and south coasts, rising at one point to a height of nearly 6,500 feet, and between them lies a plain now bare and little cultivated but once covered with forests which supplied timber for the Greek, Persian and Egyptian fleets.

Agriculture is the occupation of most of the people. Typical Mediterranean products are raised, all in the most primitive fashion, but the government is educating the natives in modern methods, is building irrigation works and re-planting the forests. Strabo, Pliny and other ancient geographers tell of great min-

LOCATION MAP

eral wealth, and our word *copper* once meant *metal from Cyprus,* for which the Greek name was *Kupros.* To-day no metals are produced, but the island is one of the world's few sources of asbestos, gypsum and umber.

Like all lands of the Eastern Mediterranean, Cyprus has a story with many chapters. Egypt conquered its Greek and Phoenician colonists

3,500 years ago, then Assyria, and still later, Persia. It formed part of the empires of Alexander and the Ptolemies, of Rome, Byzantium and Bagdad. During the Crusades it fell to Richard the Lion-Hearted, and for three centuries was a feudal kingdom. After a brief Venetian rule the Turks governed for another 300 years. From 1878 England administered the island for Turkey, but annexed it in 1914. Of the 140,000 people four-fifths are Christians, of an independent Church founded by Barnabas, who is mentioned in the *Acts* as "of the country of Cyprus." England in 1915 offered the island to the latter country for assistance in the War of the Nations, but the king declined to assist the allies.

CYRUS, *si'rus,* called THE GREAT, or THE ELDER (about 600-529 B. C.), conqueror of Babylon and founder of the Persian Empire. According to recently-discovered cuneiform inscriptions now in the British Museum, he was

TOMB OF CYRUS

Cyrus had placed upon his tomb these words: "Oh, man! whosoever thou art, and whencesoever thou comest (for come I know thou wilt), I am Cyrus, the founder of the Persian Empire; envy me not the little earth that covers my body." Alexander the Great visited the tomb, and was much affected by the inscription, which placed before him the uncertainty and vicissitude of earthly things. The tomb was broken open, and Alexander caused the author of the sacrilege to be put to death. The location is 550 miles east of old Babylon.

the son of Cambyses and Mandane, a daughter of the Median king Astyages. Legends state that Astyages feared overthrow at the hands of his grandson, Cyrus, and endeavored to have him killed when an infant. Cyrus was protected by a shepherd and was eventually restored to his parents.

Whether previously prophesied or not, the fact remains that Cyrus began his remarkable career by collecting a vast army of Persians, with which he overthrew his grandfather and became king of Media and Persia. He next made himself master of Lydia by defeating Croesus. At that time Nabonidus, king of Babylon, was unpopular with his subjects, and Cyrus considered the time favorable for an attack upon that empire. The city fell almost without a struggle before the victorious hosts of Cyrus, who declared himself king. He proved a wise and generous ruler and permitted the Jews to return to Jerusalem from captivity. His ambition and desire to increase his already vast domains led to his downfall. While conducting an expedition against the Scythians, north of his kingdom, he was slain in a battle against the forces of the Scythian queen Tomyris. His body was buried at Pasargadae, where his tomb, silent and empty, still stands alongside a broken monolith that once bore witness to his greatness.

CYRUS (? -401 B. C.), THE YOUNGER, so called to distinguish him from Cyrus, founder of the Medo-Persian Empire. He was a son of Darius II and brother of Artaxerxes, who became king of Persia in 404 B. C. Bitterly jealous of his brother's power, Cyrus conspired against him. His plots were discovered and he was condemned to death, but was spared by Artaxerxes in answer to his mother's entreaty. While acting as *satrap,* or governor, of Asia Minor, he collected an army of 100,000 men, 13,000 of whom were Greek auxiliaries noted for their bravery. He marched eastward, intending to overthrow his brother and seize the throne. Artaxerxes gathered an army and met him on the plains of Cunaxa (401 B. C.). In the fight Cyrus was slain and his army routed, with the exception of the Greeks, who not only had held their own but broke their way through all opposed to them. The retreat of the Greek soldiers and their great sufferings are immortalized by Xenophon in the *Anabasis* (which see).

CZAR, *zahr,* a corruption of the Roman word *Caesar,* was the title of the emperor of Russia, and was first adopted in 1547 by Ivan the Terrible. The Russian empress was styled the *czarina,* and the heir apparent was called the *czarevitch.* The same title is seen, in a different form, in the word *kaiser,* applied to the former emperor of Germany, and last held by William II.

CZECH, *check,* a Slavic race which became the most important element in the new Czecho-Slovakia. Their total number is at

present estimated at about 7,100,000. At one time all the Slavic peoples had one common tongue; the Czechs, however, have gradually evolved a separate language which has absorbed many German words, but still bears a resemblance to old Slavic. The spoken language is considered very musical and has a wide variety of sounds. Three centuries ago the Czechs were a prosperous nation, but they fell under the power of Austria and their nationality was lost. At the outbreak of the War of the Nations in 1914 the Czechs, occupying Bohemia, Moravia, Silesia and a part of Hungary, were placed in the curious position of being called upon to fight for a country from which they had long been endeavoring to free themselves; their sympathies were largely Russian, but they were politically Hungarians. The prosperity they attained may be said to have been in spite of the Austro-Hungarian governments rather than with their assistance. See CZECHO-SLOVAKIA, below.

CZECHO-SLOVAKIA, *chek'o slo va'ki a,* or the CZECHO-SLOVAK REPUBLIC, the most important state of those which were built upon the ruins of the defeated and disintegrated Austro-Hungarian monarchy. As early as June, 1918, it had been fully organized, with Professor

LOCATION MAP

Thomas Masaryk as President. This occurred in Paris, and the entente powers gave it prompt recognition. In January, 1919, it was evident that the entente powers at the peace conference which closed the War of the Nations were heartily in sympathy with its aspirations, for its representatives were invited to all deliberations affecting it. It had been founded on one of America's "fourteen points" that were set forth as a condition on which peace should be guaranteed to the world, namely, "self-determination of peoples." The population of the new state in 1921 was 13,595,816. Of these nearly all the people are Czechs and Slovakians, whose language is nearly the same; there are but few Germans, not a sufficient number to alter the conditions of "self-determination."

The defection of the Czecho-Slovaks was the inevitable outcome of their struggles against Austro-Hungary. They had existed as a part of the old monarchy in the provinces of Bohemia, Moravia, Silesia and Slovakia, the latter designation having been applied to a part of Northern Hungary. All this territory was merged into the new republic, and it comprises about 54,260 square miles. The city of Prague was made the capital; it had been the old capital of Bohemia.

At the beginning of the War of the Nations the Russian army contained thousands of Czechs and Slovakians, eager to fight against Austria-Hungary. When Russia withdrew from the war in 1917 these soldiers started for France by way of Siberia. In the northland they fought the bolshevik revolutionists and were kept there by the allied powers to guard the Trans-Siberian Railroad. Thousands of others joined the French and Italian armies, and thus had a really notable part in the defeat of the Central Powers. E.D.F.

Related Subjects. The reader is referred to the following articles in these volumes:

Austria	Moravia
Bohemia	Silesia
Czech	Slovaks
Hungary	War of the Nations

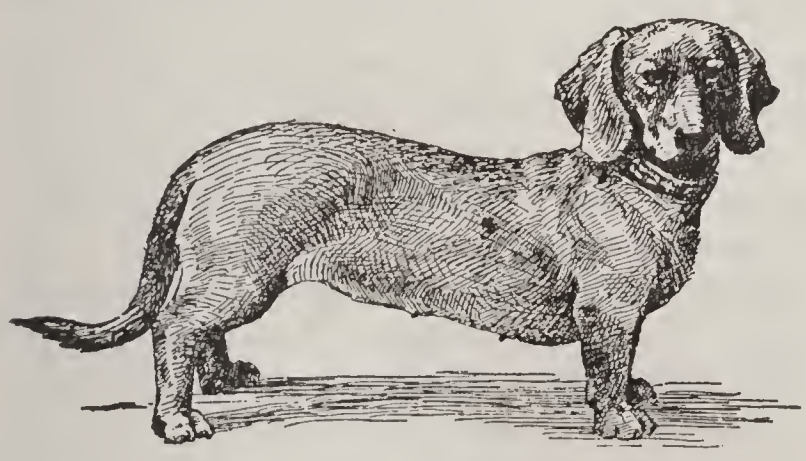
CZERNOWITZ, *cher'no vits,* capital of the former Austrian province of Bukowina, near the River Pruth, 164 miles southeast of Lemberg. It is a town of commercial importance, with manufactories of machinery, oil and lumber and many breweries. The population is very mixed, consisting of Germans, Ruthenians, Poles, Rumanians and Jews, and holiday crowds, in their varied garb, are very picturesque and interesting. The Austrian occupation, which took place in 1775, made a great change in the appearance of the town. It now possesses many handsome buildings, a flourishing university with over 1,000 students and well-equipped trade and industrial schools. The city was captured by the Russians in the early stages of the War of the Nations, in 1914, lost by them to the German-Austrian forces later, and again taken by the czar's army in the summer of 1916. At the end of the war Rumania presented a claim for Bukowina to the peace conference, as also did the Ukraine. The League of Nations is to determine the matter. Population, 1910, 87,128.

Dd

D, the fourth letter in the English alphabet, which was developed from the Greek Δ or *delta,* written in the form of a triangle. When the Greeks adopted this letter they changed its name from *daleth,* meaning *door,* to *delta.* The Phoenicians called the character *daleth,* or *door,* because it resembled the door of a tent, a familiar object at all times to those peoples. To make the sound of *d* the tip of the tongue is touched to the roof of the mouth and the breath is then forcibly expelled.

In Roman notation *D* represents 500 and with a horizontal stroke over it ($\overline{D}$) it stands for 5,000. In music it is the second note in the natural scale of C, and is the third string of the violin.

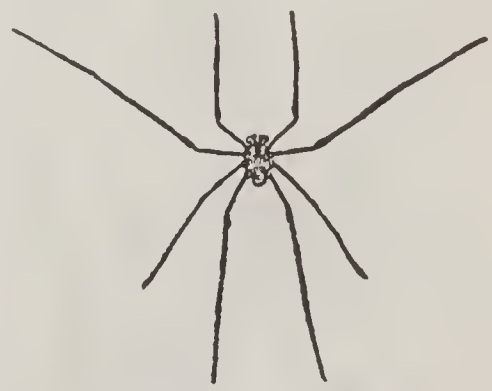
DACHSHUND, *daKhs'hoont,* a long-bodied, short-legged dog of German origin, once used in Central Europe almost solely for hunting badgers but now kept as a pet in households of many countries. It is a sturdy animal, with strongly-developed muscles. This strangely-formed dog has been humorously described as being "a dog and a half long and half a dog high." It has a long, round body, with short, thick, somewhat crooked legs; its paws are turned outward, and it has a long, conical head, tapering toward the nose. The broad, rounded ears are long and drooping, and the



THE DACHSHUND

tail is long and tapering. This type of dog has many admirers. The coat of most dachshunds is short, thick and silky, of a reddish-brown tint, but sometimes is black and tan, gray and tan, or spotted. A variety late in becoming popular is rough-coated.

DADDY-LONG-LEGS, a term applied in America to the *harvestman* or *grandfather greybeard,* a harmless, spiderlike insect with an oval body and long, slender legs. These legs are bent in the middle, so when it walks its body almost touches the ground. Its food consists of small insects.



DADDY-LONG-LEGS

In England the term signifies the *crane fly,* which also has long, slender legs, but has wings and resembles a mosquito. A species of crane fly which lives in the earth destroys grains and grass, and is found in the United States and Canada as well as in England.

DAEDALUS, *ded'a lus,* a sculptor, architect and artisan of Greek mythology, worshiped by ancient artists' guilds as the personification of art and as the inventor of carpentry and many tools. The name is from the Greek, and means *the cunning worker.* Through jealousy, according to the myth, Daedalus killed his nephew and pupil, Talos, and was obliged to

flee from Athens to Crete. There he built the famous labyrinth and Ariadne's dancing-place, both of which have been unearthed by modern excavators. Later, having offended the king, he and his son, Icarus, were imprisoned. To effect an escape, Daedalus made two pairs of wings which they fastened on their shoulders. According to the myth, Icarus fell into the sea, because he flew so near the sun that the wax fastening the wings was melted. Daedalus landed safely in Sicily, where he built several famous temples.

DAFFODIL, *daf' o dil,* an old-fashioned, ever-popular, early spring flower, a species of narcissus. It is a native of Europe, where it grows wild in woods and hedges, but it is extensively cultivated in America, Holland and England. There are various forms of daffodils. The best known is the trumpet daffodil, which inspired Shakespeare, Milton, Wordsworth and many other poets, and whose gay blossoms, masses of captured sunshine, bring to mind the chant of English children—

Daffy-down-dilly, just come to town
With a yellow petticoat and a green gown.

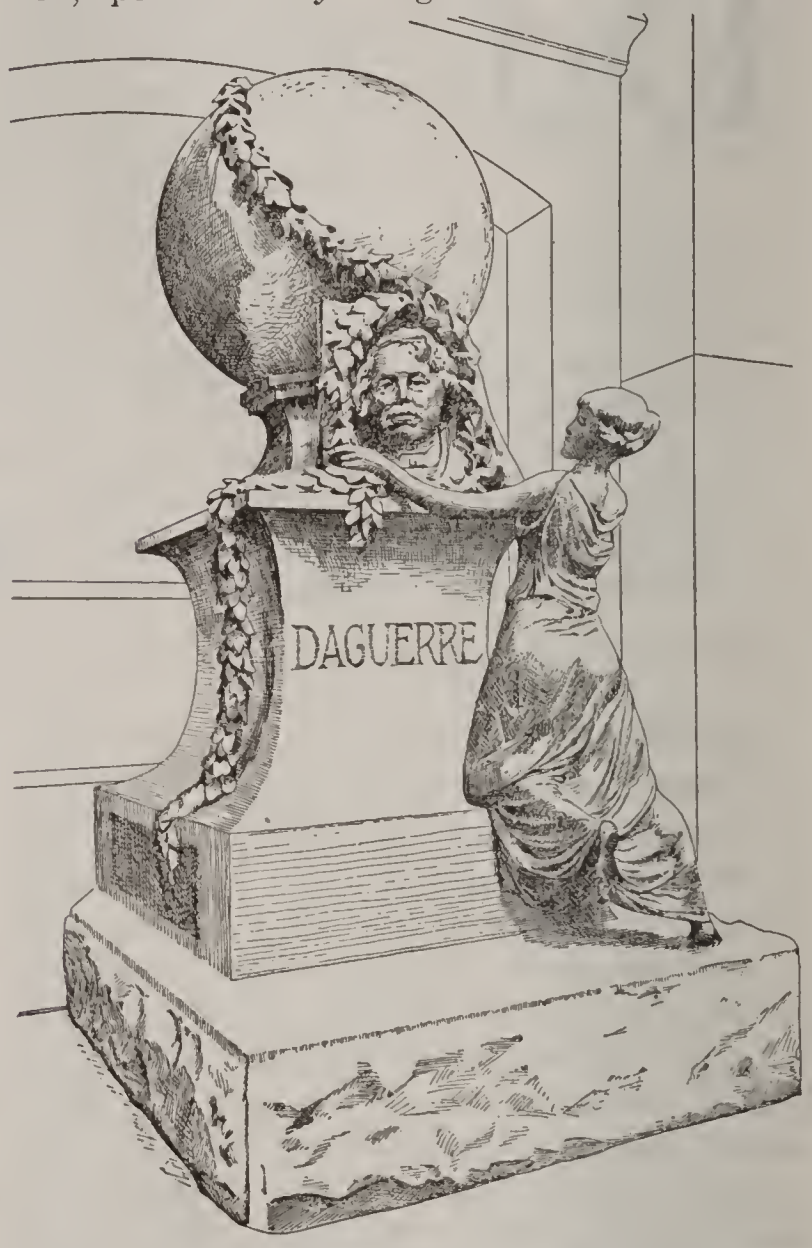
This species bears a long, yellow tube with a crinkly edge, surrounded at the base by long

Daffodils,
That come before the swallow dares, and take
The winds of March with beauty.
SHAKESPEARE: *Winter's Tale.*

yellow petals. One flower appears at the end of each stalk, standing out at right angles. The narrow, bluish-green leaves are nearly flat, and five or six grow about each flower stalk. The Van Sion is the best double daffodil listed in catalogues.

Daffodil bulbs should be planted in autumn or early winter and should be placed four inches deep and about three inches apart in free, open soil. Blossoms will appear in April. If kept indoors for winter-blooming, flowers are produced in January. See NARCISSUS.

DAGUERROTYPE, *da ger' o type,* the name given to the first practical photographic invention, perfected by Daguerre in 1839. The



IN MEMORY OF DAGUERRE
Monument in the National Museum, Washington, D. C.

process was far more complicated than any involved in modern photography, and the results obtained would now be considered most commonplace. At the time, however, it caused a great sensation in the scientific world. The process consisted in first sensitizing a polished copper plate by coating it with chemically pure silver. Then the plate was submitted to the action of vapor of iodine; following this it received further treatment with vapor of bromine. After exposure in a camera the image was developed in vapor of mercury, and the plate was immersed in a solution of hyposulphite of soda to render the result permanent. The finished picture was not much in-

ferior to the later "tintype," both being printed on thin copper plates (see PHOTOGRAPHY).

Louis Jacques Mandé Daguerre (1789-1851), a French artist and scene painter, famous as the inventor of the original photographic process described above. Although he has received all the credit of the invention, it is known that he had long corresponded with other Frenchmen who were conducting researches along the same lines; one who was approaching success died before his discovery could be announced. In recognition of his work Daguerre was made an officer of the Legion of Honor and was given a pension of 6,000 francs by the French government.

DAHLIA, *dahl'ya,* or *dale'ya,* a hardy plant of the composite family, at one time considered coarse and common, but of late appearing in such improved varieties that its wonderful development attracts almost as much attention as the chrysanthemum. It was named after the Swedish botanist, Dahl. Though a native of Mexico, the dahlia is now extensively cultivated in the United States, Southern Canada and Europe. Originally a flower with eight red rays about a yellow center very stiff and formal, the dahlia is now produced in almost every imaginable color, some compact and ball-shaped, others with long, flat petals; and the most interesting and beautiful, the cactus dahlias, have double blossoms with long, twisted petals.

DAHLIAS

Dahlias planted in May in rich soil will come to blossom in July. They must have plenty of water, a bucket a day for each plant being necessary if the season is dry. The water should be poured about the main stalk, not over the soil surrounding the plant. In case the soil is only moderately fertile it should have an application of fertilizer in the middle of the summer. As the stalks of these plants are very brittle, they should be tied to strong stakes; otherwise, a hard wind or a violent downpour of rain may break them. If the stakes are painted green they will tone attractively with the foliage. See COMPOSITE FAMILY.

DAHOMEY, *dah ho'may,* or *dah ho may',* a French colony in West Africa, formerly an independent kingdom ruled by a monarch whose power was absolute. The French obtained possession of it in 1892, during the period in which the European powers were dividing Africa among them; the army captured Abomey, at that time the capital, deposed the king and proclaimed a French protectorate. Population, 861,000; area, 42,460 square miles.

DAIL EIREANN, the name applied by the Irish outside of Ulster to their legislative assembly, the first meeting of which was held in January, 1919. The term is the Gaelic for "Irish Parliament." In December, 1918, general Parliamentary elections were held throughout Great Britain. In Ireland, seventy-three Sinn Fein candidates, some of them in prison, were elected, but all refused to take their seats in the London Parliament. Instead, twenty-five of them assembled in the Mansion House in Dublin, on January 21, 1919, and constituted themselves the Parliament (Dail Eireann) of the Irish Republic. Eamon de Valera was elected President of the Republic, Charles Burgess was elected Speaker of the Assembly, and a committee was appointed to present the claims of Ireland at the Paris Peace Conference. The so-called Irish Republic was not recognized by any nation, but the Irish people outside of Ulster looked to the Dail as their representative assembly during the whole period of guerilla warfare between the Republican Army and the British "black and tans."

In December, 1920, a new Government of Ireland Act was passed by the British House of Commons, which provided for two Parliaments in Ireland, one in the North and one in the South. Ulster accepted the act, held elections and organized its Parliament, but in the South, where Sinn Feiners won 124 out of 128 seats, the act was ignored, and a new Dail Eireann assembled. This Parliament continued to function during the negotiations between the English and the Irish envoys, which began in July, 1921. A treaty providing for the establishment of the Irish Free State, to have the same status in the empire as Australia, South Africa and Canada, was finally agreed upon, on December 6, and was presented to Dail Eireann for ratification, its leading spokesman being Arthur Griffith.

DAIRYING, or **DAIRY HUSBANDRY,** is that branch of agriculture which deals with milk and its products. In the various countries of the world local physical conditions have determined in each case the animal best suited for dairy purposes. The Arabs of the deserts obtain milk from their camels, and the Laplanders of the North keep reindeer for their milk. Some of the Tartar tribes of Asia to this day keep mares for their milk, and in many parts of the temperate regions the milk of goats and sheep is a staple article of food. In India the natives get their supply of milk from the buffalo. But of all the animals whose milk is used for food the cow is the most common, and it is the only one which need be considered here. The dairying industry is concerned exclusively with cows.

Dairy Management. To conduct a dairy successfully requires a variety of knowledge and careful attention to certain principles of management. Careful selection of the herd, properly-constructed stables and other buildings, proper feed and pasturage, and lastly, facilities for storing and marketing the product, are the principal points to be considered.

The Herd. The cows should be selected with reference to the main purpose for which the dairy is conducted. If the dairy supplies milk to city markets, the quantity of milk produced should be the determining factor, and if the dairy supplies butter the percentage of butter fat in the milk should be the principal factor to consider. It is the general experience of dairymen that the Holsteins and Ayrshires, being cattle whose milk contains only small globules of fat, produce large quantities of milk. The Jerseys and Guernseys, on the other hand, provide milk which is much richer in fat, and are therefore the best breeds if the dairy is primarily a butter producer.

On a good dairy farm a daily record is kept of the amount of milk obtained from each cow. Any cows which do not maintain the required standard should be sold or fattened for beef and their places taken by other animals. Only the calves from the best milkers should be retained for additions to the herd. In this way the herd will be strengthened from year to year. The record should give the daily quantity of milk given by each cow, as well as the total for six months or a year. The most profitable cows are those which give a uniform quantity over a long period of time. The record should also include the results of tests for the amount of butter fat. These tests should be made by experts, if possible, but if this is out of the question the dairyman can get directions and assistance from any agricultural experiment station.

The Stable. The proper housing of cows is usually the most important factor in preserving their health. Tuberculosis and other diseases are frequently the result of filthy and poorly-ventilated stables. The stables should be well-lighted, and should always have an abundance of fresh air. The walls should be kept free from accumulations of dust, and should be whitewashed frequently. The floors should be kept clean and should be covered with fresh litter every day. Partitions made of piping or iron railing are better than wooden ones, because they catch less dust and are easier to clean. The grounds in the vicinity of the stable should be kept as clean as the interior, and rubbish or manure heaps should not be allowed to accumulate.

The Feed Problem. Fresh grass is generally regarded as a most desirable feed for milch cows, but it seldom happens that the available pasturage is sufficient to feed a large herd. Some other source of food supply must be available at all times of the year, and during the winter months the cows must be fed entirely from this other source. Once the proper ration is determined, the most economic method of supplying it should be installed. Most farmers now use ensilage, or silage, as it

is more commonly called, and the silo is a conspicuous feature in almost all farm landscapes. Full details of its variety and use are given in the article SILO.

Cleanliness a Necessity. Probably no other farm product is as easily spoiled or tainted as milk. It is very sensitive to its surroundings, readily absorbs particles of matter from the atmosphere, and even absorbs odors from articles near it. Tiny particles of dirt, moreover, may contain bacteria, which may render the milk dangerous or may leave it merely disagreeable to the taste. The cows should be milked in their stalls. Sweeping or littering the cows before milking should be avoided, because these operations raise dust which may contaminate the milk. It is desirable, however, to change the air in the stable a short time before, so that it may be fresh and pure. The milkers should wear clean clothing, and their hands should be clean and dry. The flanks and udders of the cow should be wiped with a damp cloth, to remove any dirt which might otherwise fall into the pail. The old-fashioned, wide-topped pail should be avoided; those with small tops, partly covered, are the best. All utensils used in the handling of milk should be cleaned immediately after using and be scalded with boiling water. A still better plan is to steam them in a vat for several minutes. Wooden pails should not be used.

Development of the Industry. The dairy industry, as a special branch of agriculture, is of nineteenth-century growth, especially in Canada and the United States. Long before 1800, in many parts of the world, cows were being kept for their milk, but the individual farmer kept only as many cows as he needed to supply milk, butter and cheese for his family. Dairy farming to-day, on the contrary, is a specialty, and a comparatively small number of farmers supply millions of consumers.

While the industry has been growing, it has also undergone a complete change in character. In the beginning of the nineteenth century it was believed that dairying was limited by physical and climatic conditions to a small part of North America, called the "dairy belt." It was confined, also, to spring and summer, when pasturage could be obtained. Cows were usually allowed to go dry in the winter, and winter dairying was practically unknown. Under the system now employed, however, good milk, butter and cheese can be obtained, by proper management, in almost every part of North America. Cows are well-housed in the winter, and give milk practically the whole year around.

Importance of the Industry. *In the United States.* Although it is true that many farmers make dairying their principal source of income, yet there are thousands who keep only a few cows, to supply milk, butter and cheese for their families. As most of the latter group keep no accurate records of production, the census figures showing the amount and value of dairy products are somewhat smaller than they should be. The varying conditions under which the industry is carried on in different sections make it hard to find a satisfactory basis for grouping the sections or individual states in the order of their importance. There is no doubt, however, that in the Eastern states dairying is the principal source of income of most of the farmers who own cows. This is also true through the Central West. In the far Western states many farmers still keep cows primarily for beef purposes.

New York and Wisconsin are now the foremost dairy states in the Union. They have the largest number of milch or dairy cows, the largest production of milk, and they lead in the total value of products. Wisconsin, with about 1,700,000 dairy cows, is closely followed by New York, Iowa, Illinois, Minnesota, Texas and Pennsylvania. In the census of 1920, ranked according to the quantity of milk produced, New York was followed by Wisconsin, Iowa, Pennsylvania, Minnesota, Illinois, Ohio and Michigan. The total production of milk in the United States was then about 8,000,000,000 gallons a year. New York's annual output of dairy products was nearly $98,000,000, about one-eighth of the total for the United States. Next in order came Wisconsin, $56,000,000; Pennsylvania, $45,000,000; Illinois, $34,000,000; Iowa, $34,000,000; Ohio, $33,000,000; Minnesota, $31,000,000; Michigan, $28,000,000; and California, $24,000,000. It must be understood that these figures vary considerably from year to year. One of the most striking features of the dairy industry in recent years is the development of the factory system in the making of butter and cheese. This feature is discussed in the article CREAMERY.

In the Dominion of Canada. Dairying was naturally one of the first branches of agriculture practiced by the early colonists. The farmers of New Brunswick and Nova Scotia were famous at an early day for the excellence of their dairy products. As settlement spread

westward dairying kept pace with them, and as early as 1852 cows were kept with success at Fort Simpson. At Fort Good Hope, just outside the Arctic Circle, and at York Factory, on Hudson Bay, as well as other remote points, cows have been kept for many years. These examples merely show the widespread character of the industry. Ontario is still, and has been for over half a century, the center of dairying. It has over 1,000,000 milch cows, more than one-third of all the milch cows in the Dominion, and its annual output of milk is nearly half that of the Dominion. Ontario's output is approximately 4,500,000,000 pounds, or 2,250,000,000 quarts of milk a year; the Dominion yield is about 10,000,000,000 pounds, or 5,000,000,000 quarts. Quebec is not far behind Ontario, having over 800,000 milch cows and an annual output of 1,500,000,000 quarts of milk a year. Ontario and Quebec together furnish about seventy per cent of the Dominion's output of milk. A conservative estimate places the annual value of all dairy products at $100,000,000, an increase of more than sixty per cent since 1900. Most of these products are made for domestic consumption, but over $20,000,000 worth of cheese is exported each year, all but one per cent being sold to Great Britain and Ireland. Canadian cheese is famous the world over. E.H.F.

Consult Gurler's *American Dairying;* Lane's *The Business of Dairying.*

Related Subjects. For more detailed information as to the various phases of dairying the following articles in these volumes should be consulted:

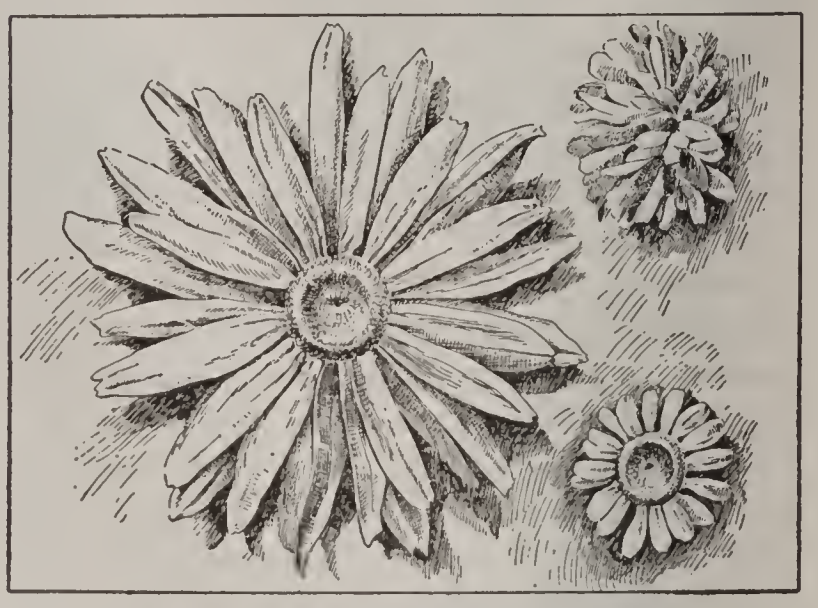
Agriculture
Barn
Butter
Buttermilk
Cattle
Cheese
Churn
Cow
Creamery
Cream Separator
Disease
Subtitle *Diseases of Animals*
Milk
Silo and Silage

DAISY, "the poet's darling," a familiar and favorite flower in Europe and America. The typical daisy is pure white and single, with a yellow or brown center. In Europe it grows commonly in all the fields and meadows,

> "And open pastures, where you scarcely tell
> White daisies from white dew."

In the United States and Canada the white daisy, a species of wild chrysanthemum, though a delight to the eye and loved by the children, is the farmer's pest, which must be killed off if he is to have hay. Without any care or attention this little flower will grow and spread and choke out other plants, so to the farmer or gardener it is a weed, the *white-weed* (see page 861); but to the florist it is the popular, hardy *marguerite.*

Many improvements have been wrought in the daisy, some now being double, and there is a great variety of colors. Burbank's Shasta



BURBANK'S SHASTA DAISY

The flower has a diameter of four inches. It was developed from the parent blossoms shown at right and drawn to scale.

daisy, four inches across, with large pure-white petals, is especially admired in garden borders and for house decoration.

In the United States the name is loosely applied to other flowers, such as the *black-eyed Susan* and some wild *asters.* This "unassuming commonplace of nature" was the emblem of love and fidelity in the days of chivalry, but in modern flower language the daisy represents simplicity and modesty. See BURBANK, LUTHER; BLACK-EYED SUSAN.

DALHOUSIE, *dal hoo'zi,* the county town of Restigouche County, N. B., situated at the mouth of the Restigouche River, on Chaleur Bay, sixteen miles east of Campbellton. Its harbor is well protected and is large and deep, having a depth of twenty-four feet at the wharf. There is steamship connection with other ports on the coast, and railway connection by a branch of the Intercolonial Railway. Dalhousie is noted for the scenery in its vicinity; everywhere are splendid forests of spruce, pine, cedar and maple. These forests also provide material for the town's lumber and shingle mills, the chief industrial establishments. The commercial fisheries and fish-packing are second only to the industries dependent on the forests, and many anglers also make Dalhousie their headquarters. Population in 1911, 1,650; in 1921, 2,130.

DALHOUSIE UNIVERSITY, at Halifax, N. S., a coeducational, undenominational institution for higher education. It has a larger

endowment, student body and number of professors and instructors than any other university in the Maritime Provinces. The teaching staff numbers about eighty, and there are about 400 students. Degrees are awarded in arts, science, music, law, pharmacy, medicine and dental surgery. In music the practical instruction given at the Halifax Conservatory of Music and other approved schools is accepted as a part of the required work; the university offers only historical and theoretical work. In pharmacy the Nova Scotia College of Pharmacy is similarly affiliated. Other affiliated institutions are the Presbyterian College, Halifax Ladies' College, Convent of the Sacred Heart and Mount Saint Vincent Academy, all at Halifax, and Prince of Wales College, at Charlottetown, Prince Edward Island.

DALLAS, *dal'as,* TEX., the leading industrial city of the state, ranking next to San Antonio and nearly equalling it in size. In 1920 the population was 158,976, an increase of 37,449 since 1910. About eighteen per cent of the entire population are negroes. The city is situated on the Trinity River, in the northeastern part of the state, and in Dallas County, of which it is the county seat. Forth Worth is thirty-one miles west, and Austin, the capital, is 210 miles southwest. Dallas has the Missouri, Kansas & Texas; the Texas & Pacific; the Texas & New Orleans; the Gulf, Colorado & Santa Fe; the Frisco; the Chicago, Rock Island & Gulf; the Saint Louis South Western; the Missouri, Oklahoma & Gulf, and the Houston & Texas Central railroads. Besides, there are five electric interurban lines in operation to Denison, Waco, Corsicana, Fort Worth and Cleburne, respectively. In 1841 the first settlement was made, and in 1866 it was incorporated as a city and named for George Mifflin Dallas, Vice-President of the United States under James K. Polk. The area of the city is nearly sixteen and one-half square miles.

Parks and Boulevards. The city provides ample recreation grounds, 713 acres being divided into twenty parks, of which City Park, Fair Park and Forest Park, with its "zoo," are especially attractive. Oak Lawn, Cliff, Turner and Central parks are among the other beauty spots of the city. There are also many well-equipped playgrounds. Dallas has handsome residences and fine streets, and improvements are still in progress, a boulevard system about sixty miles long being under development in 1917. Oak Cliff, on the west side of Trinity River, is one of the residential districts. In 1903 it was annexed to the city, with which it is connected by one of the longest concrete viaducts in the United States, completed in 1912 at a cost of $657,466.

Commerce and Industry. The surrounding region is a part of the black-waxy belt, famous for its agricultural products, especially cotton. Dallas is the largest inland cotton market in the United States, 1,500,000 bales being handled annually. It is also a leading center for the manufacture of harness, saddlery and cotton-gin machinery, and a distributing center for agricultural implements. The city is also the distributing center of the Southwest for automobiles, two assembly plants being located here. Among other important industrial enterprises are flour mills, cement plants, oil refineries, iron and metal works, cottonseed-oil mills, cotton compresses, packing houses and grain elevators.

Public Buildings. The city has a number of noteworthy buildings, the most prominent being the Adolphus Hotel, erected at a cost of $1,600,000, the county courthouse, the $500,000 municipal building, which contains thirty-five acres of floor space, the Pretorian building, the Wilson building and the Federal building; the last-named was erected in 1883 at a cost of $11,000, but a site has been purchased for a new building which will cost about $250,000. In 1914 Dallas was chosen as the location of a Federal Reserve Bank. The state fair of Texas has been held here annually since 1886. Its handsome permanent buildings are constructed of reinforced concrete, and of these the Coliseum, having a seating capacity of 5,000, is the largest. This fair is unique in its organization, as it accepts no aid from the state, and devotes its receipts to defraying the expenses of the fair and to the improvement of the fair grounds, which belong to the city.

Education. Dallas is the seat of two universities, Dallas University and the Southern Methodist University, the latter of which has 625 acres of grounds and an endowment of $2,000,000. These, with Saint Mary's Academy, Saint Edward's College, Patten's Seminary, Saint Joseph's Academy, Terrell School for Boys, five business colleges, about fifty private schools, thirty-two public schools, two medical colleges and a Carnegie Library, comprise the educational institutions of the city.

Churches and Institutions. Dallas is the see of Roman Catholic and Protestant Episcopal

dioceses. There are more than 100 places of worship, about thirty being for negroes. The most notable churches are the cathedrals of Saint Matthew and of the Sacred Heart. Three orphanages offer shelter to the homeless children of the city and two homes are for aged women. There are twelve hospitals, three rescue homes and several other benevolent institutions.

Government. In 1907 Dallas adopted the commission form of government, which is vested in a mayor, and four commissioners in charge of water works and sewerage, finance and revenue, police and fire, and streets and public property, respectively. R.H.

DALLES, *dalz,* a name derived from the French *dalle,* meaning *trough,* or *drain,* was applied by French explorers in America to rocky gorges through which rivers flow at great speed. There are several in North America, among which are the picturesque dalles in Wisconsin, near Kilbourne; the Saint Louis dalles, a series of cataracts in the Saint Louis River, near Duluth, Minn.; the Saint Croix dalles, in the same state; and the famous dalles of the Columbia River, which have given the name *The Dalles* to the oldest town in Oregon.

The dalles of the Columbia begin five miles above the town and extend up-stream from that point for nearly eight miles. Within this distance there is a fall of eighty feet, including a sheer fall of twenty feet at the upper, or eastern, end. This fall is known as the *Celilo,* but the Indians and pioneers called it, more picturesquely, *Turnwater.* At the western end is the Big Eddy, terminating what is known as the Long Narrows or *les grandes dalles.* This latter is a channel cut by natural forces through perpendicular walls of basaltic rock. It is 9,000 feet long and from 135 to 300 feet wide, and at low water the distance from the top of the wall to the water is fifty feet.

Through this gorge, which is so workmanlike in appearance that it seems to have been constructed by the hand of man, the entire volume of the river rushes, and the water boils and surges so violently that the river seems, so to speak, to be turned on edge. Beyond this stretch to Celilo Falls there are powerful currents and numerous eddies; the dalles are therefore an impassable barrier to navigation. To overcome this obstacle, the United States government has constructed a canal and lock system at a cost of $5,500,000, which was opened to commerce in 1915. See COLUMBIA RIVER. L.D.C.

DALMATIA, *dal ma' she a,* the most southerly of what was once Austria, bordering on the Adriatic Sea. It covers an area of 5,090 square miles, and is therefore about the same size as the state of Connecticut. Because of

LOCATION OF DALMATIA
With the provinces to the north and east, it is now a part of Jugo-Slavia.

a generally-mountainous surface agriculture is in a very backward state, though the valleys in the south produce olives, grapes, figs and other fruits. Dalmatia is noted for the production of *maraschino,* a liquor made from a cherry peculiar to that country. The trade is not very extensive and is confined to coast towns, the most important of which are Zara, the capital; Cattaro, with one of the finest harbors in Europe, Spalato, and Ragusa. The fisheries are important, the catches of tunny and sardines being particularly valuable. Dalmatia was an Austrian province from 1815 to November, 1918. Population, 1920, 621,503.

DALMORES, *dal mo rez',* CHARLES (1872-), a noted French tenor, who was born at Nancy, France, and received his musical education at the Paris Conservatoire. Before he discovered that he was the possessor of a voice which promised a career, Dalmores devoted much time to the violoncello. He made his debut as a singer at Rouen, in 1899, with such success that after three years he was engaged to appear in Brussels at the Theater Royal. His Brussels triumphs were repeated at Covent Garden, London, and at Bayreuth, Bavaria. In 1906 he first appeared in the United States as

CHARLES DALMORES

a member of the Manhattan Opera Company, New York. Since then he has been identified with the Philadelphia-Chicago Opera Company and is generally recognized as one of the best of the younger French tenors. Among the many rôles which he has to his credit he has won greatest renown as Don José in *Carmen,* Samson in *Samson and Delilah,* Romeo in *Romeo and Juliet,* and Hoffman in the *Tales of Hoffman.*

DAM, an artificial barrier to the flow of water, is a device older than history. Nevertheless, it is just entering on a period of usefulness until recently little suspected. The great Assuan dam has added several hundred square miles to the arable lands of Egypt; it holds back thousands of millions of gallons of the water of the Nile, to be used in irrigation. The dam at Bassano, in Alberta, is a part of the largest irrigation system in America. The Arrowrock dam, in Idaho, the highest dam in the world, is one of several new irrigation dams which store billions of gallons of water for the United States irrigation service. The Croton dam, one of the highest masonry dams, controls New York City's water supply. The dam across the Mississippi River from Illinois to Keokuk, Iowa, generates half as much electric power as Niagara. Another important dam is the Gatun, which maintains the level of water in the Panama Canal. All of these great dams have been completed in the present century.

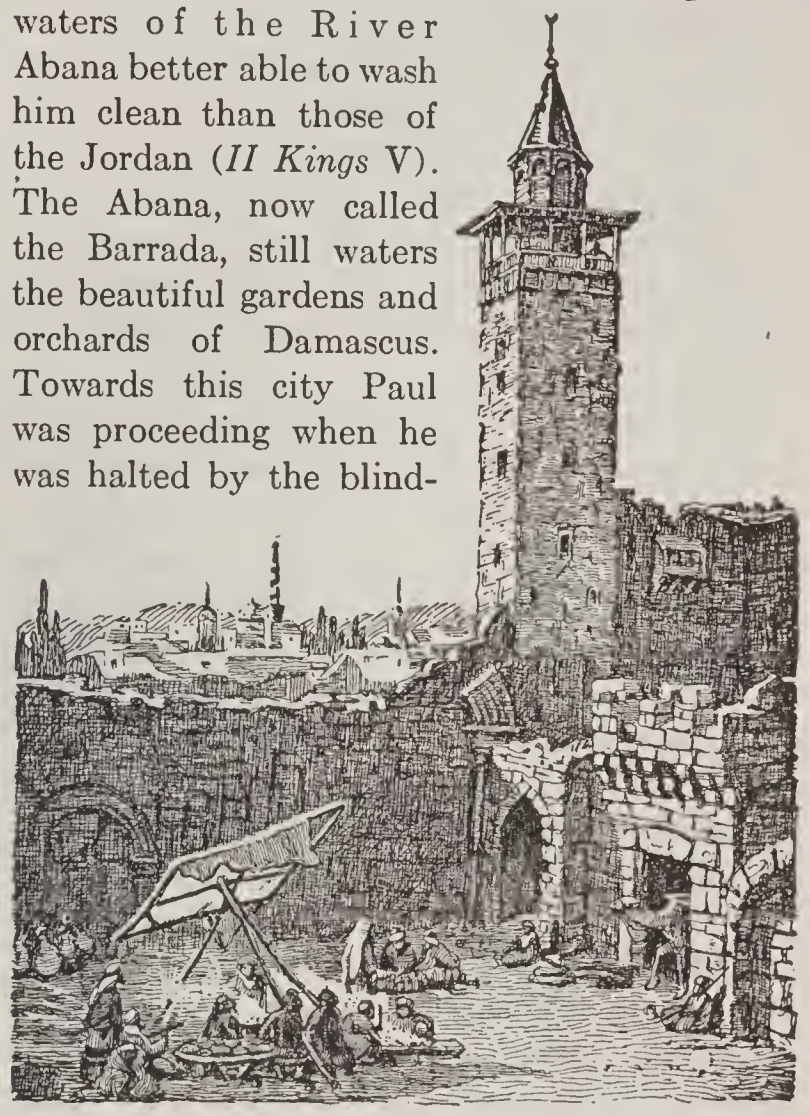
The earliest dams were earthen, and many modern dams, including the Bassano and Gatun dams, are built largely of earth. Timber, in the use of which the beavers anticipated man, makes a very durable dam, but one not suited for high structures. Steel has been used in a few dams. As the pressure of the water against a dam is in direct proportion to its depth, the highest dams are built of masonry or concrete. The Arrowrock, 354 feet high, is of concrete; the Shoshone, in Wyoming, 328.4 feet high, is the world's highest masonry dam.

The dikes of Holland, the levees of the Mississippi and the artificial banks of the Yellow River in China are dams built, not to utilize water, but to prevent damage from floods.

Related Subjects. Wider information on the topic of dams may be gained from the following articles in these volumes:

Alberta	Irrigation
Aqueduct, (Illustration)	Jetty
Assuan	Keokuk Dam
Canada	Levee
Idaho	Mississippi River

DAMASCUS, *dam as' kus,* one of the most ancient cities of the world, now the capital of the Turkish province of Syria, in Asia. Practically nothing is known of its origin; but that it was a place of some importance even in the days of Abraham is indicated by Biblical references (see *Genesis* XIV, 15). There still stands, according to some authorities, the house of Naaman, the leper, who thought the waters of the River Abana better able to wash him clean than those of the Jordan (*II Kings* V). The Abana, now called the Barrada, still waters the beautiful gardens and orchards of Damascus. Towards this city Paul was proceeding when he was halted by the blinding light of conversion. There, in "the street called Straight," still stands the house of Judas, in which the disciple Ananias found the penitent apostle (*Acts* IX).



OLD EAST GATE AND WATCH TOWER

As of old, the streets are still mean and narrow, the outside of the houses gloomy, forbidding, and in many cases unsanitary. The interior of the better-class dwellings, however, is in contrast with the sordid exterior. Beautiful courts paved with marble, ornamented with trees and shrubs, fountains spraying cooling waters, and refreshing shade await the visitor who passes through the outer door. Many homes are furnished in luxurious style, with not a few modern Western appointments, yet Damascus remains the most Oriental in manners and customs of all Eastern cities. To the visitor the bazaars of Damascus are of intense interest. They consist of small stores on each side of covered streets, very similar to modern arcades.

Damascus is now a busy city, and houses that once shook to the martial tread of Syrian hosts now look down on modern street car lines. Once a stronghold of Christianity, Damascus is now holy city of the Moslems, where vast numbers annually meet for the pilgrimage to Mecca. It is also an important center of Oriental trade, noted for its production of silks, damask and cotton fabrics. The sword blades for which the city was famous for centuries are no longer made there (see *Damascus Steel,* below). Damascus has had probably the most eventful history of any Eastern city. In turn under the power of the Syrian, Israelite, Persian, Greek, Roman and Crusader, it fell at last into the hands of the Turks, who captured it in 1516. Population, estimated, 250,000.

Damascus Steel, a steel of high quality, originally produced in Damascus and other cities of the East, of special value in making highly-tempered sword blades. Its extraordinary hardness and elasticity were produced by careful and laborious forging, doubling and twisting of the steel, which contained more carbon than other steel. The sword blades of Damascus were richly ornamented with designs that penetrated completely through the metal without in any way affecting its strength and temper. F.ST.A.

DAM'ASK, originally a "flat-figured satin" in which the weft was woven into the warp in such a way as to make figures such as fruit, flowers, leaves and other forms. The name was given the fabric from Damascus, the city where it was first manufactured. The varieties now most widely known are the linen damasks used for tablecloths and napkins, so desirable for their beautiful, soft, satiny luster. The best of these are made in Germany, France, Scotland and Ireland. Handsome and expensive furniture coverings are damasks of silk and of wool.

DAMOCLES, *dam'o kleez,* a courtier and flatterer of the tyrant Dionysius of Syracuse. His extravagant description of the happiness of kings caused his royal master to read him a lesson. He was invited to a sumptuous banquet and was seated at the table in royal luxury. On looking up, he was horrified to find a sword suspended by a single hair over his head. Dionysius thus desired to emphasize the uncertainty of his life, even when in seeming security. The "sword of Damocles" has come into vogue as an expression referring to impending or dreaded tragedy that may happen at any moment. See DIONYSIUS THE ELDER.

DAMON, *da'mun,* AND PYTHIAS, *pith'i as,* two noble youths of Syracuse, whose love for each other, recorded in a popular legend, is universally regarded as the highest ideal of friendship. Pythias, or Phintias, had been condemned to death by Dionysius, tyrant of Syracuse. He secured permission to leave the city to put his affairs in order, Damon offering himself as a pledge for his friend's return, to suffer death himself in place of Pythias should the latter fail to keep his promise. Pythias, unexpectedly delayed, arrived just in time to save Damon from death. It is said that Dionysius so admired the spirit of friendship animating the two that he immediately pardoned Pythias and besought the two youths to become his friends. This incident is the basis of the principles on which the fraternal order The Knights of Pythias was established (see PYTHIAS, KNIGHTS OF).

DAMROSCH, *dahm'rosh,* the name of a family, originally German, two members of which have played an important part in the advancement of music in the United States.

Leopold Damrosch (1832-1885) was born in Posen, Prussia, and was educated for the medical profession, in accordance with his parents' wishes, at the University of Berlin. In 1854, shortly after he had begun practice in Posen, he took up the formal study of music, to which he was devotedly attached, and in 1855 entered upon the career of a concert violinist. After serving as director in Posen and in Breslau, he emigrated to America in 1871, and began a brilliant career in New York City. He founded the Oratorio Society in 1873, the Symphony Society in 1877, and organized several large musical festivals.

To Damrosch alone is due the honor of permanently establishing choral societies in New York; but he achieved the crowning glory of his career when, in 1884, he successfully introduced German opera at the Metropolitan Opera House. In this great theater his funeral services were held a year later. He also won distinction as a composer of cantatas, pieces for the violin, songs, and a festival overture.

Walter Johannes Damrosch (1862-), son of Leopold, continued the work which his father had begun. He was born in Breslau, Prussia, studied piano and harmony, and in 1871 accompanied his father to America. In 1881 he was appointed organist of Plymouth

Church, Brooklyn, and four years later, on the death of his father, succeeded him as director of the Oratorio and Symphony societies. The Damrosch Opera Company, founded by him in 1894 for the production of Wagner's music-dramas, toured the United States for several seasons.

Between 1900 and 1902 he conducted the German operas at the Metropolitan Opera House, in 1902 began a season with the Philharmonic Society, and in 1903 brought about the reorganization of the New York Symphony Orchestra as a permanent orchestra. This organization is now one of the best of its kind. The compositions of Damrosch include two operas, *The Scarlet Letter* and *Cyrano de Bergerac,* a *Te Deum,* a sonata for violin and piano, and several songs.

DANA, *da'na,* Charles Anderson (1819-1897), for twenty-five years the most noted of American journalists, was born at Hinsdale, N. H. While working in his uncle's store in Buffalo he prepared himself for Harvard College and entered in 1839, but was obliged to leave after two years on account of trouble with his eyes. In 1842 he became a member of the Brook Farm Association and edited *The Harbinger* in Boston in its interest (see Brook Farm). In 1847 he joined the staff of the New York *Tribune* and later became its managing editor, resigning from this post on account of differences of opinion with Horace Greeley regarding Mexican War policies. During the latter part of the War of Secession (1863-1864) he was assistant Secretary of War under Stanton. After the war he edited the Chicago *Republican* for a time, but it failed and he returned to New York.

In 1868 he became part owner and editor-in-chief of the New York *Sun,* holding this position during the remainder of his life and conducting its interests and policies with such remarkable success as to raise its valuation to $5,000,000. "If you see it in the *Sun,* it's so," he made the slogan of that journal. The *American Encyclopedia* was edited under his direction, and he also collaborated with General J. H. Wilson in a *Life of Grant.* Dana possessed keen judgment and brilliant intellect and his editorials in the *Sun* were widely read for their literary quality.

DANA, James Dwight (1813-1895), an American geologist and one of the most eminent scientists of the nineteenth century. In his early school days in Utica, N. Y., his birthplace, he eagerly devoted himself to the study of the natural sciences. After graduating from Yale in 1833, he was appointed instructor in the United States navy. This position gave him unusual opportunity for travel and investigation. As a member of the Wilkes Exploration Expedition (1838-1842), sent out by the United States government to explore remote parts of the Pacific Ocean, he made many interesting discoveries concerning marine animals, which he later described in books and reports. From 1855 to 1890 he served as professor of natural history at Yale, and for forty-nine years was editor of the *American Journal of Science,* in which many of his papers were published. Among his noted works are *System of Mineralogy, Manual of Geology, Text-Book of Geology, Coral Reefs and Islands* and reports on *Zoöphytes, Geology* and *Crustacea.*

DANA, Richard Henry (1815-1882), the author of *Two Years Before the Mast,* one of the immortal books of American literature for boys. From his earliest boyhood Dana had a passion for the sea, and except for powerful pressure from his family, would have entered the United States navy. Yielding to their wishes he entered Harvard College, and was apparently started on the beaten path which would have made him a distinguished Boston lawyer. In later life he did become one of the foremost American authorities on international law, but his work as a lawyer will be long forgotten when *Two Years Before the Mast* still has a place in the heart of every boy.

At nineteen Dana was a junior in college, when failing eyesight forced him to give up his studies. He shipped on the brig *Pilgrim* for a two years' cruise around Cape Horn and along the west coast of North and South America. His father, also Richard Henry Dana (1787-1879), a lawyer and poet of reputation, possessed social prominence and independent means, and young Dana might have gone on a pleasure cruise, a gentleman in search of health. Instead, he shipped as a common sailor, and for two years there was no burdensome task, no harsh treatment, no stormy weather which constituted the routine for the common sailor, that he did not know at first hand. At twenty-two, he wrote the story of these years, probably the most accurate record of a sailor's life ever written. It has not only the value of a record, but it has the touch of imagination, of the wonder and mystery of the sea which will make it a living book so long as sea and sky endure. It was distributed by

the Admiralty throughout the British navy, and to-day it has a place in the library of every American man-of-war.

DANBURY, Conn., a city famous for more than a century for the manufacture of men's hats. It is one of two county seats of Fairfield County, Bridgeport being the other, and is situated on both banks of the Still River, in the southwestern part of the state, five miles from the New York state line. New York City is sixty-five miles southwest; Waterbury is thirty miles northeast. The Danbury & Highland division of the New York, New Haven & Hartford Railway serves the city, and trolley lines operate to Bethel and East Danbury. In 1920 the population was 18,889, a decrease of 1,345 since 1910. The area is five square miles.

The region in which Danbury is located is a picturesque, mountainous country, with good roads, and valleys and lakes for camping and fishing. Lake Kenosia, a pleasure resort, is two miles west of the city. Locally, Danbury is called *The Hat City.* It became known for hat-making in 1780, and in this industry in 1914 it ranked first among the cities of the United States. Important also are the allied silk manufactories and leather and fur factories for making hat accessories. Thirty-six factories altogether are engaged in this business. Automobile parts, electric novelties, machinery and boxes of all kinds are among the other manufactures of the city. Besides the public schools, there are business colleges, a library with 22,000 volumes (in 1916) and the State Normal School. The Federal building was completed in 1916 at a cost of $120,000; the courthouse, state armory and county jail are structures worthy of note.

The first settlement was made in 1684, under the Indian name of *Pahquioque.* It was organized as a town in 1687, was incorporated as a borough in 1822 and received its city charter in 1889. D.D.L.

DANCING, *dan'sing,* a form of exercise and recreation, accompanied by music, which, in its highest form, is an expression of the sense of rhythm and the delight in graceful movements that are common to human nature. Dancing as it is known to-day has developed from a primitive human instinct, the desire to show emotion by means of action, represented by the war dance of the savage or the dance of rejoicing on the return of the tribe from a successful hunt; but by civilized peoples of modern times it has been enjoyed chiefly as an agreeable pastime or an artistic feature of a public entertainment.

The grace and rhythm of the dance are paralleled in nature in the rise and fall of the waves upon the shore, the rippling of the brook, the play of light and shadow, or the tossing of the flowers in the wind. These natural forms of rhythm are an especial delight to the poets. In *The Brook,* Tennyson sings:

> I slip, I slide, I gloom, I glance,
> Among my skimming swallows;
> I make the netted sunbeam dance
> Against my sandy shallows.

Wordsworth, charmed by the sight of a field of golden daffodils, joyfully exclaims:

> Ten thousand saw I at a glance,
> Tossing their heads in sprightly dance.

Examples of the poetic expression of the rhythm in nature might be multiplied indefinitely.

Modern Dances. The dances that have enjoyed popularity since the beginning of the modern period had their origin in the general awakening of the arts in the fifteenth century (see Renaissance).

Catharine de' Medici (1519-1589) made dancing fashionable in France, and her countrymen have always excelled in this artistic form of

recreation. The dance which they brought to the highest degree of perfection was the *minuet,* which, founded on an old rustic dance, was introduced into Paris in 1650, finding its way into England three years later. This fairest flower of court dances, with its gràceful and stately movements, low salutations and polite curtsies, was a favorite society dance in America in colonial times, where it harmonized most beautifully with the quaint and charming costumes worn by the ladies and gentlemen of the period.

Of the later modern dances, none other has probably had quite the popularity of the *waltz,* which was introduced into European circles about 1795. It is danced in triple time, with smooth, gliding steps which have a backward and forward direction. The waltz is one of the most graceful ballroom dances, and some of the most exquisite dance music ever composed, notably that of Johann and Richard Strauss, is written in waltz time.

The *two-step,* which came into vogue about 1890, is a rival of the waltz in popularity. This is a more spirited dance than the waltz and is based on one that was known in Hungary centuries ago, but in its modern form it is of American origin. Two-step music is distinctly exhilarating, and is brilliantly represented by the bright and tuneful marches of John Philip Sousa.

The *quadrille,* a square dance of French origin, whose modern development dates from 1815; the *lanciers,* an adaptation of the quadrille, developed about 1836; the *polka,* first danced about 1835; and the *schottische,* a modification of the polka, all had their period of popularity and decline. Occasionally one sees the old-fashioned square dances enjoyed at informal parties, and the old English country dance survives in the *Virginia reel,* known in the country of its origin as the *Sir Roger de Coverley.* In this dance the couples face each other in two long rows. A charming description of the Sir Roger de Coverley may be found in Dickens' *Christmas Carol,* in the story of the Fezziwigs' Christmas ball.

The Sensational "New" Dances. In 1911 a curiously-named and not altogether refined dance called the *turkey-trot* made its appearance in San Francisco. Modifications of it soon followed—the *bunny hug,* the *grizzly bear,* the *Texas Tommy,* and others—and Europe and America went dance-mad. A great many people objected to these dances on moral grounds. The dances just named were soon replaced by others more refined in character, which were admitted, after some opposition, into standard dancing schools and adopted generally by the dancing public. Most important of these were the *tango, one-step* and *fox-trot,* all based on walking steps, and the *hesitation* and *waltz canter,* modifications of the regular waltz. A peculiar feature of this craze was the dancing in public restaurants by the patrons of these establishments.

On the vaudeville stage the old-time polka and schottische were revived and were received with great favor. All through the period just described interest in stage dancing maintained a high level, and many public dancers of genuine artistic ability made their appearance. Of these, the Russian dancer Pavlowa attained unrivaled perfection in the art. Others who attained distinction were Isadora Duncan, Ruth St. Denis, and Adeline Genee.

Primitive and National Dances. In its earliest forms among primitive races, dancing was a mode of expressing strong emotions of joy, sorrow and triumph, or solemn religious feeling. The North American Indians, in their ferocious war dances, worked themselves up to a state of mental intoxication capable of carrying them irresistibly on to victory. Magic enters largely into the dancing of all savage peoples, illustrated by the buffalo dances of the Mandan Indians, the object of which was to bring game in a time of scarcity of food; or the mystic dances of the Central African rain doctors, practiced during a season of drought. National or folk dances are those which are characteristic of the people of particular countries, such as the *fandango* and *bolero* of Spain, the *tarantella* of Italy, the *mazurka* and the *polonaise* of Poland, the *reel* and *Highland fling* of Scotland, and the *jig* of Ireland and Wales. B.M.W.

DAN'DELION, a plant found throughout the world, sometimes cultivated for use as a vegetable or a medicine, but nearly always growing wild in lawns and meadows and regarded as a troublesome weed. Lowell thus describes it:

Dear common flower that growest beside the way
Fringing the dusty road with harmless gold.

The name comes from French words meaning *tooth of a lion,* and was suggested by the smooth, coarsely-toothed leaves. The flower head is a lovely golden yellow, which changes later to a cotton-like, white "blowball" of feathered seeds which sail far and wide on the winds, and so are well distributed (see SEEDS, subtitle *Seed Dispersal*). The flower stem is

smooth, erect and hollow, and the entire plant contains a white, milky juice.

Young dandelion leaves are often used for greens and salads. If blanched like celery, they will become more tender and less bitter. The thick, fleshy taproot, sometimes twenty inches long, when carefully washed and thoroughly dried is used for its medicinal properties in diseases of the liver and in dyspepsia. Over 200,000 pounds of dandelion root, commanding from four to six cents a pound, are imported into the United States each year.

ROOT OF DANDELION

The length of the root is from ten to twenty times the height of the plant above the ground.

DAN'DRUFF, a white, scaly substance that forms on the scalp as the result of a skin that is too dry, or because of certain scalp diseases. When the head is scratched large quantities of minute scales are loosened from the skin and cling to the hair or fall on the clothing. Dandruff may be simply scales of skin, but in the disease known as *seborrhoea* oily matter secreted by the glands dries and forms scales which are also classed as dandruff. Any scaly formation results in a gradual loss of the hair, and dandruff is a very important cause of baldness. Vigorous massaging of the scalp daily, to stimulate the circulation, and frequent shampooing with pure soap are helpful remedies, but stubborn cases should have the attention of a specialist.

DANIEL, *dan'yel,* a Hebrew prophet, the hero of the Old Testament book which bears his name. No other Biblical hero is more popular, for his wonderful rise from the position of captive and slave in a royal household to that of ruler of the kingdom was brought about not through kingly favor but through Daniel's own wisdom and goodness. When Nebuchadnezzar, king of Babylon, swept down upon Jerusalem, he carried off not only the sacred vessels from the temple but a number of high-born youths, of whom Daniel was one. In Babylon, Daniel refused to eat of his "portion of the king's meat," lest he might defile himself, but throve so well on his simple diet that he attracted the notice of the king.

One night King Nebuchadnezzar had a troublesome dream which his wise men could not interpret. But Daniel, declaring that "there is a God in heaven that revealeth secrets," described the dream and gave the interpretation, and as a reward was made ruler over the whole province of Babylon. In later years he made clear another royal dream, which foretold the madness of Nebuchadnezzar, and interpreted to Belshazzar, the son of Nebuchadnezzar, the marvelous handwriting on the wall (see BELSHAZZAR). Under Darius, the Median, who fulfilled the writing by capturing Babylon, Daniel was given high authority by reason of his wisdom, but the Babylonian princes became jealous and by a trick had him cast into a den of lions. His miraculous preservation led Darius to acknowledge the God of the Hebrews and put an end to the persecutions of Daniel, who from this time on "prospered in the reign of Darius, and in the reign of Cyrus the Persian."

DANISH WEST INDIES. See VIRGIN ISLANDS OF THE UNITED STATES.

DANTE ALIGHIERI, *dahn'ta ah le gya're,* (1265-1321), one of the world's great poets, the chief pride and ornament of Italian literature. As Homer's name is associated with the *Iliad,* Vergil's with the *Aeneid* and Milton's with *Paradise Lost,* so that of Dante, the fourth great epic poet, calls instantly to mind the *Divine Comedy*—that marvelous account of the wanderings of a poet soul in hell and purgatory. No less intimately connected with the name of Dante is that of Beatrice, the idol of his life from his childhood and the inspiration of his poetry, although he never saw her more than a few times and she had very little knowledge of him. He tells in his *New Life* of his meeting with her when he was but nine years of age, and traces the course of his love. This was an idealized emotion, far removed from desire for possession and from jealousy, for he loved her just as devotedly and with no hint of bitterness after her marriage to another (see BEATRICE PORTINARI).

Dante was born in Florence, of a family which probably belonged to the lower nobility, and though little is known of his youth and education it seems certain that he was associated with the poets and learned men of his time. In 1292, when he had recovered from the grief into which the death of Beatrice plunged him, he married Gemma Donati, who bore him two sons and two daughters. Shortly after his marriage he entered political life, and in the Florence of those days this promised anything but a peaceful life. The Guelphs (see GUELPHS AND GHIBELLINES), shortly afterward

DESTROYED FOR GUN METAL

This imposing bronze statue of Dante, at Trent, Austria, was demolished in 1916 to furnish material for the manufacture of cannon.

split up into two rival factions known as the Whites and the Blacks, and Dante allied himself with the former, the more moderate branch. The Blacks, or Papal party, coming to power in 1302, the leaders of the Whites were banished, and with them, Dante. For the rest of his life he was an exile, and his history during that time is semi-mythical. He visited several cities, but certainly not all that have since put forward claims to that honor, and in September, 1321, died at Ravenna, where he was buried.

His Great Work. Dante wrote other things—*The New Life,* mentioned above, *The Banquet* and a treatise *On Monarchy*—but his fame rests on the *Divine Comedy.* This he called *Comedy,* in accordance with the custom of the time, because it ends cheerfully, and appreciative readers added the epithet *Divine.* In large part, at least, it was written during his exile, and shows the firm grasp and keen insight of a mature man. It represents the poet as traveling through hell and purgatory under the guidance of Vergil, and through paradise with the radiant, glorified Beatrice as his guide. In hell, over the gate of which appear the words, "All hope abandon, ye who enter here," he sees the hosts of guilty souls, whose sin and punishment he pictures in few words but with passionate force; in purgatory there are like scenes, but the gloom is not so deep, as the punishments are merely temporary.

With entrance into the earthly paradise all that is sordid and evil disappears, and the poet moves with Beatrice through beautiful flowers, soft breezes and sweet sounds. Finally he emerges into the celestial paradise, where he feels himself in the presence of God, but cannot see Him because of the excess of light. So, in a burst of triumph, ends this greatest poem which the Middle Ages produced. It has been translated into many languages, Longfellow having made an excellent poetical translation into English, and an enormous number of books have been written about it. Interest in it bids fair to remain unflagging as long as men love great poetry. A.MC C.

Consult Fletcher's *Dante Alighieri,* in "Home Library" Series; Toynbee's *Dante in English Literature.*

DANTON, *dahN toN',* GEORGES JACQUES (1759-1794), a French Revolutionary leader, born at Arcis-sur-Aube. In 1780 he went to Paris and attached himself to Mirabeau, and after the latter's death, to Robespierre and Marat. It was he who uttered the fierce words, "To the kings, we will fling down the head of a king as the gage of battle," meaning that Louis should be beheaded. Danton was known among the Revolutionary leaders as terrible and fearless, but later he would have joined those who were striving for a republic, in order to check further bloodshed. The Girondists, however, would not join with him and he was forced to stay with the Jacobins, which party had organized the Reign of Terror, but the most cruel among this party finally gained the upper hand and Danton was guillotined.

Related Subjects. The reader is referred to the following articles in these volumes:

French Revolution
Girondists
Jacobins
Marat, Jean Paul
Robespierre, Maximilien Marie Isidore

DANUBE, *dan'ube,* the most important water route in Europe and second only to the Volga, among the rivers of that continent, in length and drainage area. The Danube has its origin in the junction of two small mountain streams of the Black Forest, in Germany, which unite at a point 2,187 feet above sea level. It follows a general easterly course and winds and curves for 1,750 miles before it reaches its outlet, the Black Sea. Its drainage basin, 315,000 square miles in extent, almost one-tenth of the total area of the continent of Europe, includes Southern Germany, Bosnia, Serbia, Bulgaria and Rumania. The city walls of Ulm, Ratisbon, Passau, Vienna, Budapest and Belgrade are washed by the waters of this great waterway. It was the center of Roman colonization and the scene of inroads of Huns, Magyars and Avars, and the highway which brought the Turk westward and down which he was finally driven in his easterly flight. The source and course of the river are shown on the accompanying map. See, also, map of EUROPE, for elevations.

COURSE OF THE DANUBE

Commercial Importance. The Danube is the chief natural route for the commerce of Central Europe, and its value as a commercial highway has been greatly enhanced by extensive improvements made from time to time. At least $10,000,000 has been appropriated for making the Iron Gate navigable; commerce through this gap is regulated by an international commission, with headquarters at Galatz. Communication with the Rhine has been established by the construction of the Ludwig Canal in Bavaria, and the Sulina channel mouth, at the delta, has been deepened so as to permit the entrance of large ocean-going vessels. The annual tonnage through this mouth in times of peace is 2,000,000.

The Iron Gate, mentioned above, is a mountain pass between Orsova, Hungary, and Gladova, in Serbia. J.R.

DAN'VERS, MASS., a residential and manufacturing city of Essex County, four miles northwest of Salem and nineteen miles northwest of Boston. It includes the villages of Danvers Center and Danvers Port, and has an area of nearly twelve square miles. It is on a small river of the same name, navigable to the Atlantic Ocean, a short distance east, and is served by the eastern and western divisions of the Boston & Maine Railroad and by interurban lines. The population in 1910 was 9,407; as reported by the Federal census of 1916 it was 9,949.

Danvers is an attractive New England town with wide, well-paved streets, shaded by splendid old trees. It is the home of Saint John's Preparatory College (Roman Catholic), the Essex County Agricultural College, Peabody Institute Library and the Danvers Historical Society. The state insane asylum, situated here, has a plant erected at a cost of nearly $2,000,000. Danvers Park is nearly one square mile in extent. The principal industries include the manufacture of leather, shoes, electric lamps and bricks.

Danvers was once part of Salem. In 1752 it was incorporated as a separate town, and in 1855 was divided into South Danvers (afterwards Peabody) and Danvers. In that part of the town keeping the original name, witchcraft first occurred in 1692, and of the number of citizens of the district who were arrested ten were convicted and hanged (see WITCHCRAFT). The many places of historical interest in Danvers include the birthplace of Israel Putnam, the Revolutionary soldier; Mount Burnett, a place frequented by Hawthorne, and Oak Knoll, the home of Whittier. The government is administered by town meetings. A.E.F.

DANVILLE, ILL., is the county seat of Vermilion County, in the east-central part of the state, five and one-half miles from the Indiana state line, 123 miles south of Chicago and thirty miles east of Champaign. It is on the Vermilion River and on the Chicago & Eastern Illinois (whose railway shops are here); the Cleveland, Cincinnati, Chicago & Saint Louis; the Wabash, and the Chicago, Indiana & Southern railroads, and on the Illinois Traction electric line. The population in 1910 was 27,871; in 1920 it was 33,750.

The city has the Danville Branch National Soldiers' Home, a Federal building erected in 1910 at a cost of $300,000, a courthouse costing $185,000, a Y. M. C. A. building, Masonic Temple, Carnegie Library and two public hos-

pitals. The parked area exceeds 100 acres and comprises Lincoln, Ellsworth, Cannon, Douglas and Garfield parks.

Danville is in a soft-coal district and coal mining is among the important industries, which also include founding and the manufacture of zinc, hardware, carriages, glass and clay products.

The town was settled in 1830, incorporated in 1839 and became a city in 1867. Four suburbs have been annexed, Vermilion Heights in 1905, South Danville in 1906, Germantown and Roselawn in 1907. The city is the home of Joseph G. Cannon, for many years notable in the public life of the nation. P.L.W.

DANVILLE, VA., an important industrial center of Pittsylvania County, centrally located on the southern state boundary line, 141 miles southwest of Richmond. It is on the Danville River and on the Danville & Western and the Southern railroads. In 1910 the population was 19,020; in 1916 it was 20,021. The area exceeds three square miles.

Danville is in the fertile Piedmont section, situated on heights which command fine views of the country round about. Tobacco, grain, fruits and other produce are extensively grown in the surrounding region, and the city has an important trade in loose-leaf tobacco and manufactured products. Abundant power is supplied by the river for its industrial plants, which include tobacco factories, a cheroot factory, flour mills, knitting mills, elevator works and manufactories of cotton goods, furniture, trousers and overalls. There are large tobacco warehouses, and the city has important wholesale interests, supplying a wide territory in Virginia and North Carolina.

The city is the seat of Roanoke Institute (Baptist), Randolph Mason Institute (Methodist Episcopal) and Danville School for Boys, and contains a city hall, public library, Masonic Temple, a hospital, an orphanage and several parks. It was incorporated as a town in 1792 and chartered as a city in 1833. The records of the Confederacy were removed to the city after the fall of Richmond in 1865, and it was for a time the Confederate capital. H.B.W.

DANZIG, *dahn'tsik,* a German city, but by the Treaty of Versailles in 1919 internationalized as a part of the "Danzig corridor." It is on the Vistula River, about three miles from the Baltic Sea. The city retains much of its picturesque medieval aspect, for it is over 700 years old; it contains, however, many beautiful modern buildings. It is a very thrifty city, noted for its brandy, beer and other liquors; it has for many years been a center of manufacture of arms and munitions of war; this important industry gives employment to many thousands of men. Ships of the largest size are built in the imperial shipbuilding yards and those of private concerns. The trade of the city was increased by the opening, in 1899, of the harbor at Neufahrwasser, at the mouth of the Vistula. Steel mills, distilleries, flour mills and sugar refineries have recently been established and these establishments were being rapidly developed before the beginning of the War of the Nations in 1914. Danzig fell to the possession of Prussia in the partition of Poland in 1793; it was taken by the French in 1807 but was restored to Prussia in 1814. Population, 1919, 194,953; of "corridor," 351,380.

DAPHNE, *daf'ne,* in classic myths, a beautiful nymph who delighted in woodland sports and hunting, the daughter of the river-god Peneus. She desired to remain unmarried, like Diana, but her beauty brought many lovers. Apollo, especially, pierced by a golden arrow from Cupid's bow, was filled with love for her. But Daphne, pierced by Cupid's leaden arrow, abhorred the thought of loving. One day Apollo chased Daphne through the woods, and when her strength failed she called on her father to change her form. Immediately she was changed into a laurel tree, and ever after the laurel was sacred to Apollo. He wore a wreath of its leaves as a crown and since then laurel wreaths have been symbols of honor and merit. See LAUREL.

APOLLO AND DAPHNE
Statue by Bernini, in the Villa Borghese, Rome.

DAPHNIA, *daf'ne ah,* or **WATER FLEA,** a very tiny fresh-water shellfish (crustacean), which moves through water in skips and jumps, like a flea, using its feathery feelers (anten-

nae) as oars. The body of this microscopic animal is encased in a dainty, transparent, hinged shell. The head is prolonged into a snout and is provided with feelers and a single, central, compound black eye. There are five pairs of appendages, which move continually, aiding the animal's breathing. Some water fleas turn red in summer, and, swarming in millions in ponds and marshes, impart their color to the water.

DARDANELLES, *dahr da nelz',* a strait connecting the Aegean Sea with the Sea of Marmora, which in turn, at its eastern extremity, is connected by the Bosporus (literally, *ox-ford*) with the Black Sea. The two straits,

THE DARDANELLES
The small black areas mark the extent of the advance of the entente nations in the disastrous Gallipoli campaign.

together with the Sea of Marmora, form a waterway leading from the land-locked Black Sea to the Mediterranean Sea. The European nations have long recognized the fact that any one nation which controlled both of the straits and the Black Sea could build and assemble a war fleet in the Black Sea which would be practically safe from attack and yet have all the maritime nations of Europe at its mercy.

The Dardanelles is a narrow channel, easily defended, and is recognized as the keystone which hitherto has held together the Turkish Empire. When Turkey was defeated in the War of the Nations the Dardanelles was occupied by allied warships. The power which holds the straits inevitably holds Constantinople, and when in 1920 the Dardanelles was internationalized—opened to all—the Turks' power in Europe was broken. The importnace of the Dardanelles has frequently been proved in the history of Turkey, but never more clearly than in 1915, during the War of the Nations. For almost a year the allied armies and fleets attempted to force a passage to Constantinople, only to retire at last, either because the cost in men and money proved too terrible, or because, as the Turks have claimed for years, the Dardanelles was impregnable. The accompanying map shows the very slight foothold gained by the allies, at tremendous cost.

At its narrowest point the Dardanelles is only one mile wide from the European to the Asiatic shore. Its average width is three to four miles, and it is about forty-seven miles long. The channel has an average depth of less than 200 feet. Except when the wind is blowing eastward across the Aegean Sea, the Dardanelles has a strong outward current, but a powerful undercurrent flows in the opposite direction, and is constantly carrying a supply of salty water through the Dardanelles, the Sea of Marmora and the Bosporus into the Black Sea. It is this undercurrent which keeps the Black Sea from gradually becoming a fresh-water body.

In Myth and Story. To the ancient Greeks the channel was known as the *Hellespont,* that is, Sea of Helle, in honor of Helle, daughter of Athamas, a king in Boeotia, and the goddess Nephele, or Cloud. Athamas later married Ino, a mortal, who planned to sacrifice Phryxus, brother of Helle, to the gods. Nephele saved her children by giving them the ram with the golden fleece, but as they were crossing the strait between Europe and Asia, Helle fell from the ram and was drowned. The fleece of this ram was afterwards sought by Jason and the Argonauts (which see).

Another famous legend is that of Hero and Leander. Near Abydos, where the strait is about 6,500 feet wide, Leander is said to have swum across each night to see Hero, and in modern times the poet Byron, in emulation, accomplished the same feat in one hour and ten minutes. See HERO.

Just when the name *Dardanelles* began to take the place of *Hellespont* is uncertain. The word is derived from the ancient Greek city of Dardanus, on the Asiatic side of the strait. The city, according to legend, was built by a hero of the same name, a son of Zeus and Electra. This hero became the founder of the race of Dardani, and was the ancestor of Aeneas.

In History. Almost from the dawn of history, the Dardanelles has been of strategic importance, and has constantly figured in wars and in peaceful negotiations. Near Abydos, later the scene of Leander's and Byron's exploits, Xerxes crossed into Europe with a great army in 480 B.C., and here, too, Alexander led his forces across a great bridge of boats in 334 B.C. Centuries later the strait, or more

properly, Constantinople, became the heart of the Byzantine Empire, and it was not until the Turks were in absolute command of the Dardanelles that the empire was doomed.

After the fall of the empire in 1453, the Turks remained absolute masters of the Dardanelles. In 1807 a British fleet forced its way through to Constantinople, which up to that time had never seen a hostile fleet. In 1841 the five great powers of Europe—Great Britain, France, Russia, Prussia and Austria—agreed with Turkey that no foreign man-of-war should pass the Dardanelles without Turkey's special permission. This agreement was renewed in 1856, after the Crimean War, and again in 1871 and in 1878.

For many years it was Russia's announced intention to secure a change in this policy, and if possible to secure for itself the control of the strait, that it might have access to the sea from ports that were never frozen. Great Britain was the leader of the opposition to Russian expansion. With the revolution and the end of Russia as a great power this danger was averted. J.R.

DAR'FUR, the most westerly state of the Anglo-Egyptian Sudan, in East Central Africa. It covers an area of 150,000 square miles and consists chiefly of a vast plateau nearly 3,000 feet above sea level. The inhabitants are negroes and Arabs whose chief occupations are agriculture and raising cattle. Ostriches are also bred, and their feathers are an important item of commerce. The climate is fairly healthful, except in the rainy season, which lasts from June to September. There are no rivers, but instead there are many small water courses, which are filled with raging torrents during the rains. Copper, iron and salt are produced, and the mineral wealth of the country is very great. The capital is El Fasher, a town with a few buildings in European styles but consisting principally of straw-covered huts. The country is ruled by a sultan under British guidance, and it pays a yearly tribute of $2,500 to the Anglo-Egyptian government. Population, about 1,000,000.

DARIEN, *da ri en',* the name given to a gulf and isthmus geographically located between the continents of North and South America. The isthmus, however, is no longer known by that name, but is now called the Isthmus of Panama. The isthmus was reached by Columbus on his fourth voyage, in 1502, and was an early field for Spanish exploration and settlement. It was crossed in 1513 by Balboa, governor of the Darien settlement, who from its highest point discovered the Pacific Ocean. The first settlement was that of Santa Maria del Antigua, situated on the small Darien River, northwest of the Atrato. The gulf of the same name is a portion of the Caribbean Sea, between the republics of Colombia and Panama, its southern extension being called the Gulf of Uraba.

Darien Scheme, a gigantic project launched in 1695 by William Paterson, a Scotchman and first projector of the Bank of England, to establish a colony and commercial center on the Darien isthmus near Panama, in order to gain trade for Scotland. European manufactures were to be sent to the Gulf of Darien and conveyed by land across the isthmus, where the products of South America and Asia were to be exchanged. Nearly $4,000,000 was subscribed, although a considerable portion of it was never paid in, and in 1698 five vessels laden with merchandise and provisions, with 1,200 persons, sailed from Leith, the Scottish port, for New Caledonia, the name given to the new Darien settlement. The climate proved unhealthful, the Spaniards attacked the defenseless colony, the English colonies of America disapproved, and after a period of eight months the colonists were compelled by disease, famine and persecution to return to Europe. Paterson lost his reason for a time, but later recovered. In 1706 the lords commissioners for England purchased the shares of private individuals of the Darien Company, to bring about a better understanding between Scotland and England.

DARIUS, *da ri' us,* the name of the three greatest monarchs in the long history of Persia. Only two of them, however, are of present-day interest.

Darius I (558-485 B.C.) was one of the most notable rulers the East has ever produced, for he was distinguished as a statesman, as a warrior and as an organizer. The record of his achievements, which he had carved in cuneiform writing on a lofty cliff known as the Behistun Rock, in Western Persia, states that in the year 521 B.C. he slew Gautama, who had usurped the Persian throne on the death of Cambyses, and made himself ruler of Western Asia and Egypt (see CUNEIFORM INSCRIPTIONS). After putting down revolts in various parts of his empire, he devoted himself to the arts of peace. The Persian realm was divided into *satrapies,* or provinces, with a governor over each; a magnificent system of post roads was built, and a national coinage was provided.

During his reign Darius undertook several wars, mainly for the purpose of strengthening the boundaries of his empire and of holding in check the barbarous tribes on the frontier. He conquered the Punjab in Northwestern India, but was unsuccessful in a war against the Scythians. In 490 B. C. a great army under Darius was defeated by the Greeks at Marathon during the memorable Persian invasion of that year (see MARATHON). In 480 B. C., while he was preparing to send another army to Greece, and when Egypt was in revolt, Darius suddenly died.

Darius III, the last king of Persia, came to the throne in 336 B. C., at a time when the kingdom was in a state of decline. Philip of Macedon had already begun offensive warfare against the Persians, and the campaign was renewed in 334 B. C. by his son, Alexander the Great. Darius took the field in person against the great conqueror, and was totally defeated at Issus in 333 B. C., and at Arbela two years later. In 330 B. C. he was deposed and killed. See PERSIA, subhead *History.*

DARK AGES, the name given to a period in the history of the world, of about 700 years' duration, between A. D. 475 and 1137. It was so called because it was overshadowed by the splendor of the Roman Empire during the period immediately before, and by the wonderful culture and learning of the Revival of Learning (see RENAISSANCE) which followed. During the Dark Ages the civilization of the world neither slipped back nor was at a standstill, as many believe, except in the field of architecture. Just as the dead-looking trees prepare through the winter for a season of fruit and flowers, so were powerful influences working through the Dark Ages for a period of splendor and advancement. See MIDDLE AGES.

DARMSTADT, *dahrm'shtaht,* capital of the former German grand duchy of HESSE, is seventeen miles south of Frankfort and twenty-one miles east of Mainz, about midway between the Main and Rhine rivers. The older portion of the town contains narrow and gloomy streets, but a new part has been added, with wide, clean thoroughfares, fine residences and several beautiful squares. The ducal palace, former residence of the Grand Duke, is of imposing size and contains a great library and a valuable collection of paintings. Darmstadt is now an important manufacturing town, with large iron foundries, machine shops, many breweries and several chemical factories. The old part of the town dates from the seventeenth century; the modern city was founded by the Grand Duke Louis, who ruled the duchy from 1790 to 1830. In Darmstadt was born the famous chemist, Justus von Liebig. Population, October, 1919, 82,367.

DARTER, SNAKE BIRD, or **WATER TURKEY,** a beautiful tropical and sub-tropical web-footed bird resembling the cormorant. Species are found from tropical America northward to Western Mexico and South Carolina, in Southern Asia and in tropical Western Africa, as well as in Australia. These birds are nearly three feet long. Their plumage is glossy, greenish-black, with silvery

THE DARTER

markings on the back of neck and wings. The tail is broad and brown-tipped; the bill is olive above and yellow below; the feet are olive with yellow webs. Darters perch on trees by the water side, and after hovering an instant over the water dart at their fish prey, follow it under water, spear it with the sharp bill, and, coming above water, toss the fish in the air to catch for eating. Their necks are long and snakelike, and suggested the second name above. Boatmen in Bengal tame the Indian darter.

DARTMOUTH, *dart'muth,* a town of Halifax County, Nova Scotia, on Halifax harbor, directly opposite and one mile east of the city of Halifax. It is the terminus of the Halifax & Eastern Railway. Dartmouth is practically a suburb of the capital city, with which it is connected by ferry service. It is attractively

laid out, has many fine residences, and has excellent facilities for boating and bathing. It also has manufacturing industries of importance; chief among its products are refined sugar, lumber, chocolate, spice, corn meal, beer, soap and bolts. Dartmouth was founded in 1749, the same year as Halifax. Population in 1911, 5,058; in 1921, 7,899.

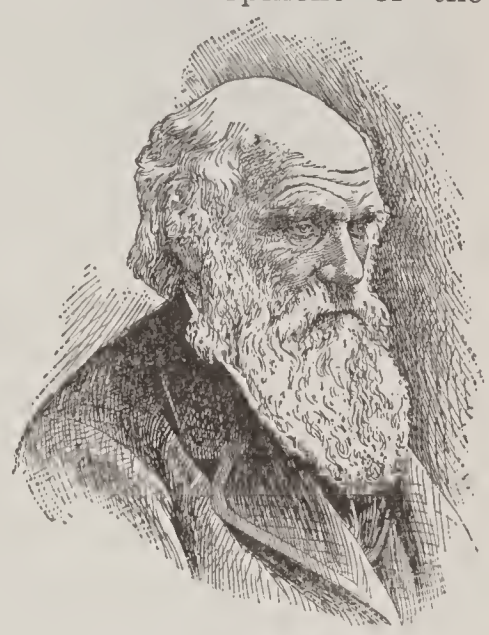
DARTMOUTH COLLEGE, at Hanover, N. H., one of the oldest American colleges, is the outgrowth of a charity school for poor Indians. The Indian school was established in 1754 at Lebanon, Conn., but in 1770 was removed to Hanover. Meanwhile, its friends had raised an endowment fund, and it had been decided to admit whites as well as Indians. The endowment fund was placed in the hands of a board of trustees, of which William, the second Earl of Dartmouth, was chairman. A large tract of land in New Hampshire was given to the school, and in 1769 King George III signed a charter for Dartmouth College, named in honor of its chief patron. The college began existence in log huts in the midst of a wilderness, and the first permanent building, Dartmouth Hall, was not completed until 1791. The Revolutionary War put an end to most of the support from England, but gradually the attendance and endowment were increased.

The college now confers degrees in arts, letters, science, civil engineering and medicine, has 130 instructors and about 1,800 students. The medical school dates from 1798 and the Thayer School of Engineering from 1867. The Amos Tuck School of Administration and Finance, founded in 1900, was the first commercial school in the United States to accept only college graduates as regular students. An endowment fund of $4,000,000 and an annual tuition fee of $140 for each student provides most of the college revenue.

Many distinguished men are numbered among the graduates of Dartmouth, including three eminent statesmen—Daniel Webster, Thaddeus Stevens and Salmon P. Chase.

Dartmouth College Case, one of the most important cases ever decided by the Supreme Court of the United States. The court held that a charter granted by a state was a contract, and that any attempt by the state to alter it was unconstitutional, because "no state shall . . . pass any . . . law impairing the obligation of contracts" (Constitution of the United States, Art. I, Sec. 10). The case arose from a religious and political struggle for the control of the college. The state legislature had amended the charter by adding eleven new trustees to outvote the old members of the board, but the latter, with Daniel Webster for attorney, carried the case to the Supreme Court. The decision was handed down by Chief Justice Marshall in 1819.

DAR'WIN, CHARLES ROBERT (1809-1882), a distinguished English naturalist, whose epoch-making work, *The Origin of Species by Means of Natural Selection,* published in 1859, laid the foundation for the development of the theory of evolution (which see). His career shows the power of hereditary influence, for his grandfather, Erasmus Darwin, was a naturalist of some distinction, and his father, Robert Waring Darwin, was a fellow of the Royal Society. Charles Robert was educated at the University of Edinburgh, and at Christ College, Cambridge, graduating in 1831.



CHARLES DARWIN

His father had hoped to see his son become a clergyman, but the young man's liking for natural history overshadowed other interests, and not long after his graduation he eagerly accepted an offer to sail with the British surveying expedition on the steamship *Beagle,* in the capacity of naturalist. The expedition made a five-years' tour of the world (1831-1836), affording Darwin an extraordinary opportunity for original research and study of plant and animal life, and giving him the basic ideas upon which he built his theories of evolution.

On his return to England he began the preparation of a series of important scientific works, culminating in 1859 in his *Origin of Species.* Up to this time it had been generally believed that each kind of animal was descended from a like species, that dogs had always been dogs, and tigers had always been tigers, and that the division of the animal kingdom into species was due to special acts of creation. But Darwin's explanation of the origin of species was based on the law of natural selection, or the survival of the fittest. That is, in the plant and animal world, vast numbers of individuals are produced, but in the struggle for existence

only the strongest, or "fittest," survive. The special qualities are inherited which make these individuals superior to those that perish; the next generation starts from a higher plane, and so on through successive generations. A continuation of this unconscious selecting process accounts for the peculiarities of the existing species; the result of the selective process he called "perfect adaptation." This adaptation theory is of fundamental importance in the scheme of evolution.

In 1871 Darwin gave to the world a second epoch-making book, *The Descent of Man,* in which he extended his theory to include the human race. Though at the time he brought upon himself the severe criticism of those who interpreted as actual fact the Bible story of the Creation, yet since his death the underlying principles of evolution as applied to man have come to be generally accepted.

The later years of the great naturalist were devoted to the elaboration of his theories, and though he labored under the worst of handicaps—continual ill-health—his perseverance and industry bore fruit in a remarkable list of publications. These include *Fertilization of Orchids, Expression of the Emotions in Man and Animals, Different forms of Flowers in Plants of the Same Species* and *The Power of Movement in Plants.* He was buried in Westminster Abbey. B.M.W.

Consult Thomson's *Darwinism and Human Life;* Francis Darwin's *The Foundations of the Origin of Species.*

DAS'KAM, Josephine Dodge. See Bacon, Josephine Dodge Daskam.

DATE AND THE DATE PALM. In the hot, dry lands of deserts and caravans, and in the land of pyramids and mummies grows that stately tree which so constantly appears in poetry and proverbs of the East, the *date palm,* the palm tree of Scripture. On that tree, at a distance of fifty, sixty or even a hundred feet from the ground, grow golden bunches of a fruit which for as many as four thousand years has been one of the principal articles of food for the brown-skinned peoples of the lands of Northern Africa and Southwestern Asia. The tree is also cultivated in China, and in France and Italy.

Next to the cocoanut palm, the date palm is without doubt the most interesting and useful of the palm family. The tall, straight stem, nearly the same thickness throughout its length, throws from its summit a magnificent crown of large, feather-shaped leaves which have been used in religious services of pagans, Jews and Christians from earliest times. There, too, appear the inconspicuous flowers, male and female on separate trees. Later, if fertilization has been secured by placing a bunch of pollen-bearing blossoms in the tree with the female

IN A NORTH AFRICAN ORCHARD

flowers, the flower stalks bear twenty- to twenty-five-pound bunches of from 180 to 200 dates.

These palms begin to bear from six to ten years after planting, and produce each from 100 to 600 pounds of fruit a year, bearing for a century or more. Date palms require a very hot, dry climate having an average temperature of 90° F. for three months of the year. A sandy, alkaline soil is satisfactory. Plenty of water must always reach the roots, so irrigation and artesian wells are made use of, for the fruit will not ripen unless the summer season is rainless. In Algiers there is an oasis where the trees are grown in deep pits dug in the soil, so the roots may reach the moisture far below the surface.

The Fruit. Although it is a light golden color when on the tree, most people know the date in its dried form as an oblong, fleshy, sweet fruit about two inches long, deep russet in color, containing a hard, oval seed with one deep furrow. Dates are eaten either fresh or dried. Cakes of them pounded and kneaded together are the food of the Arabs who traverse the deserts.

As the food value of dates is high, their nutritive qualities being equal to those of wheat and corn flour, efforts have been made to cultivate date palms in the United States. The area devoted to commercial date culture is limited to such regions as the Salton Basin and hot interior valleys of Central California; the valley of the Colorado River to the Nevada boundary; the lower Salt and Gila river valleys in Arizona, and a small portion of the lower

Rio Grande Valley in Texas. Up to 1917 over 4,500 trees in bearing in Arizona, California, Texas and Florida have produced about 10,000 pounds of fruit yearly, valued at a little over $500. But over 22,000 trees not of bearing age were at that time reported, almost 20,000 of them being in California, so the date industry in the United States may still develop into one of importance.

HOW DATES ARE GATHERED

Uses. Besides the food value of the fruit, there are a number of other economic values credited to the date palm. A liquor resembling wine is made from dates by fermentation. The trunk of the tree and other parts are used for fuel and in the construction of fences, etc. The leaves are used for matting, baskets and bags; the fiber, in making rope. The buds are eaten as a vegetable. When roasted, the fruit stones are used as a substitute for coffee, and when ground they yield an oil. When the oil has been extracted the remaining substance is valued as food for cattle. M.S.

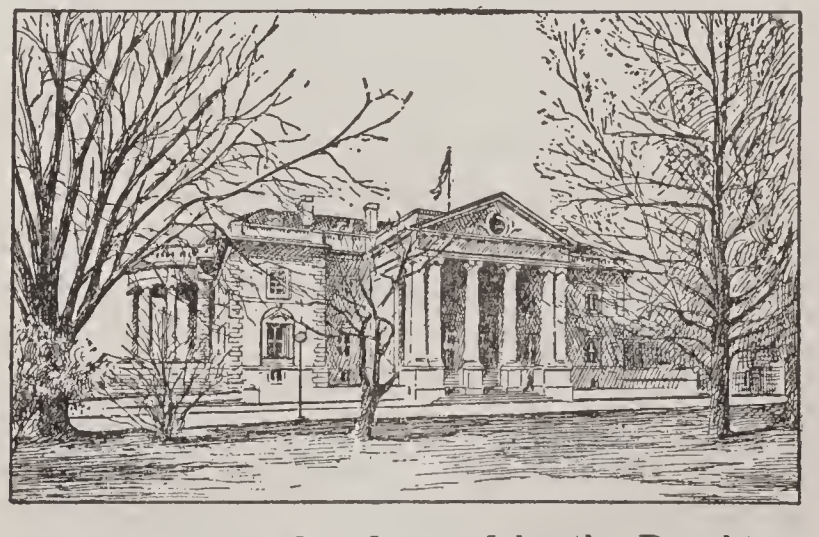
For information relating to the growing of dates in America, consult bulletins issued by the secretary of state of Arizona.

DAUDET, *do deh',* ALPHONSE (1840-1897), a French author and dramatist, famous because of his keenness of observation and ability to write what he saw. In his younger days he was deprived of the pleasures most boys enjoy, and at the death of his father he went to the college of Alais, a little town of the Cevennes, where he worked and studied, later becoming a tutor. He was unhappy in this, and in 1857 he abandoned teaching and took refuge with his brother Ernest, who was earning $15 monthly by writing for newspapers in Paris. This sum supported the brothers until the dawn of brighter days.

When he was eighteen Alphonse published *Les Amoureuses,* a small volume of poems which gave him some recognition in the literary world and soon led to appointment as private secretary to De Morny, half brother of Napoleon III. About this period he dramatized *Numa Roumestan* and wrote several plays. In 1868 he issued *La Petit Chose (The Little Chap),* an autobiographic novel. His best and most enduring novels were written during the following fourteen years, and include *Jack, The Nabob, L'Evangeliste, Tartarin of the Alps* and *Sapho.* The latter, the best known of his works and probably the one of lowest moral tone, yet teaching a striking lesson, he considered his masterpiece. *Sapho* has become known through its dramatization to thousands of people who never read one of Daudet's books. Throughout his literary career he was given help and inspiration by his wife, whom he married in 1867.

ALPHONSE DAUDET

DAUGHTERS OF THE AMERICAN REVOLUTION, a society organized in Washington, D. C., October 11, 1890, for the purpose of perpetuating reverence for the forefathers' deeds in Revolutionary history, the erection of monuments and the collection of relics. Any woman is eligible for membership at the age of eighteen, provided she is acceptable to the society and is a lineal descendant of an an-



Building erected and owned by the Daughters of the American Revolution, in Washington, D. C. It is called Continental Hall.

cestor "who, with unfailing loyalty, rendered material aid to the cause of independence as a recognized patriot, soldier or sailor, or as a civil officer in one of the several colonies or states." Besides headquarters in the national capital, where the society owns a beautiful memorial hall completed in 1910, there are chapters in nearly every state in the Union, under direction of a state regent, with local chapters in every city. The chief officer of the society is the president-general.

DAUPHIN, *daw'fin,* the official title of the eldest son of the king of France before the Revolution of 1830. The name, which means *dolphin,* belonged originally to the lords who ruled the province of Dauphine, and was adopted as their title because of the three dolphins worn on their helmets. The last lord, who had no children, ceded his province to Charles of Valois, the grandson of the French king, with the provision that the heir to the French throne should always be called the Dauphin of Vienne and should rule the province. At first the dauphin had many privileges as ruler of the province of Dauphine, but later when it was put under the same rule as all other provinces, the title became merely honorary.

DAUPHIN, a town in Manitoba, on the Vermilion River and the Canadian Northern Railway, 178 miles northwest of Winnipeg. From a population of 1,134 in 1901 it grew to 2,815 in 1911 and the census of 1921 gives an increased population to 3,885. This increase is largely due to the construction of the Canadian Northern Railway, which made possible the development of a rich grain-growing region. The storage and shipment of grains and the manufacture of flour are Dauphin's chief industries, but mention should also be made of machine works, a creamery, sash and door factory, saw mill and mineral water factory. Good fishing is to be had in the neighborhood in Lake Dauphin and Lake Winnipegosis, and there is some big game in the Riding Mountain Reserve, to the south.

DAVENPORT, *dav'en port,* Iowa, a progressive manufacturing city and the county seat of Scott County. Davenport ranks third in the state in population, following Des Moines and Sioux City. It is situated in the eastern part of the state, on the Mississippi River. Clinton is thirty-five miles northeast, Cedar Rapids is seventy-four miles northwest and Des Moines, the capital, is 175 miles west. Railway lines entering the city are the Chicago, Rock Island & Pacific; the Chicago, Milwaukee & Saint Paul, and the Chicago, Burlington & Quincy; interurban lines extend north to Clinton and west to Muscatine. Additional transportation facilities are provided by packet lines plying the river between Saint Louis and Saint Paul. In 1835 a company headed by Colonel George Davenport purchased the present site of the city. It was incorporated as a town in 1838, and the city charter was granted in 1851. Its population increased from 43,028 in 1910 to 56,727 in 1920; the foreign element is chiefly German. The area is eight and one-fourth square miles.

Davenport lies on the slope of a steep hill, near the foot of the Upper Rapids of the Mississippi River, and commands a fine view of the river and Rock Island, with which it is connected by a great bridge. This island is owned by the United States government, and here have been erected an arsenal, military headquarters and several costly Federal buildings. Davenport and two cities in Illinois just across the river—Moline and Rock Island—are known as the *Tri-Cities.*

Steel mills at Davenport employ 2,400 men and have an annual output valued at $14,000,000; locomotive works employ 400 men, and the value of their annual output is estimated at $3,000,000. In 1920 there were 219 factories, with $19,994,000 capital; the products were worth $32,500,000. The country around Davenport is an agricultural and coal-mining section, and large quantities of farm produce are shipped from this point. The grain and flour business is important.

The park reservations of Davenport comprise 120 acres, and much attention is given throughout the city to shrubbery and garden effects. In addition to its public and parochial schools, there are Saint Ambrose College, Saint Katherine's Academy for Girls, Immaculate Conception Academy and the Academy of Natural Sciences, with a large scientific library; the public library was provided by Andrew Carnegie and the city. Davenport is the see of a Roman Catholic archbishop and of a Protestant Episcopal bishop. C.C.H.

DA'VID, King of Israel (1041-970 B. C., Biblical chronology). David was a shepherd lad, the youngest son of Jesse, the Bethlehemite. He had seven brothers, all strong, brave men, but David is spoken of as "having a beautiful countenance, and goodly to look upon." The Lord directed the prophet Samuel to go to Bethlehem and pour oil on David's head to

indicate that he was set apart to become king of Israel. Samuel did as he was directed, "and the spirit of the Lord came mightily upon David from that day forward"; but David returned to the care of his flocks, all unconscious of his future responsibilities and greatness.

DAVID
From the statue by Michelangelo, in Florence, Italy.

David and Goliath. David was about sixteen when he was anointed by Samuel. When he was about twenty a war broke out between the Israelites and the Philistines, and David's brothers joined the army of Saul, the king of Israel. One day Jesse told David to take some food and clothing to his brothers. He found the two armies arranged on the opposite sides of a valley, ready for battle. For forty days the armies had held this position, and each day a giant of the Philistines, Goliath by name, came forth into the valley and taunted the Israelites to send a man to fight with him, saying that if the Israelites killed him then the Philistines would be the servants of Saul, but if he killed the Israelite then Saul's army would become servants of the Philistines.

The Israelites were sorely troubled, for no one in all Saul's army dared fight Goliath on those terms. Then David came. He made a few inquiries about this boastful giant who defied the armies of the living God, and volunteered to accept his challenge. Having obtained Saul's consent, he ran into the valley in his simple shepherd's garb, with only his staff and sling for weapons. Goliath was clothed in heavy armor and carried a sword and a spear. David ran to the brook and picked up a few smooth stones for his sling. He was then ready for the conflict. In breathless amazement the two armies looked upon the young shepherd, for, placing a stone in his sling, he hastened to meet his foe. When he reached the proper distance, David stopped and hurled a stone, which struck Goliath in the forehead with such force that even his armor was no protection against it, and he fell to the ground. David then drew the giant's sword and cut off his head and brought it to Saul. The Philistines fled in dismay. David had won a great victory for Israel.

David and Jonathan. Jonathan was Saul's eldest son, and he and David became fast friends. Jonathan loved David as he loved his own soul. David was a sweet singer and a skilful player on the harp. He was a brave soldier as well, and after he killed Goliath he remained with the army. He soon became a commander, and wherever he went he led his forces to victory. He was very popular with the soldiers and with the people, but Saul was of a melancholy disposition and often gave himself up to fits of sadness. On these occasions he frequently sent for David to sing and play upon the harp, to drive away his gloomy spirits. Once when David was returning from a great victory over the Philistines he was given a rousing reception by the people and the women sang—

> Saul hath slain his thousands,
> And David his ten thousands.

This made Saul so angry that he determined to take David's life. From this time until Saul's death David was obliged to live in another country to escape Saul's anger. During all those years Jonathan stood between his father and David, in whose behalf he once risked his life in defending David before the king. Finally, in the Battle of Gilboa, the Israelites were sorely defeated by the Philistines. Jonathan was slain, and Saul was so severely wounded that he took his own life. David said of Jonathan—

> Thy love for me was wonderful,
> Passing the love of women.

David as King. After the death of Saul, David became king of Judah, and had his capital at Hebron. For several years there was war between the forces of David and the forces of Saul, who were now under the leadership of Abner. But the forces of David grew stronger while the forces of Saul became weaker, and after seven years of struggle David became king of all Israel. He established his capital at Jerusalem, which became the "City of David."

As king, David gave his attention first to conquering the hostile nations by which he was surrounded, so Israel could have peace. He was so successful in this that within a few years all these nations were subdued, the boundaries of Israel were extended to their greatest limit, and the nation became supreme in that part of the world.

David next gave his attention to strengthening the laws and the religious life of the people. He brought the Ark to Jerusalem, and made that city the religious as well as the civil capital of the nation. He is supposed to have written the Twenty-fourth Psalm at the time of bringing up the Ark. He asked of God the privilege of building a temple for His worship, but because he had been a man of war this was denied him. He was, however, permitted to make the plans and collect much of the material, which his son and successor, Solomon, wrought into the magnificent Temple of Jehovah (see TEMPLE).

The Psalms. David was said to have composed at least seventy-three of the Psalms, which are still read and sung wherever the Bible is known, and their influence upon the Christian world is beyond estimate. He arranged the praise service for the sanctuary and is said to have been the originator of the orchestra.

Estimate of His Character. David was the greatest king of his time, and by many authorities is considered to have been the greatest king the world has ever known. He was not a perfect man, for, like other men, he sinned, and suffered for it. But when he was convinced of wrong-doing he was great enough to repent and obtain forgiveness. He reigned forty years and prepared for the accession of Solomon to the throne. This great ruler was one of the ancestors of Christ, "Great David's Greater Son." His farewell words to Solomon embody the chief characteristics of his own life—"Be thou therefore strong and show thyself a man." W.F.R.

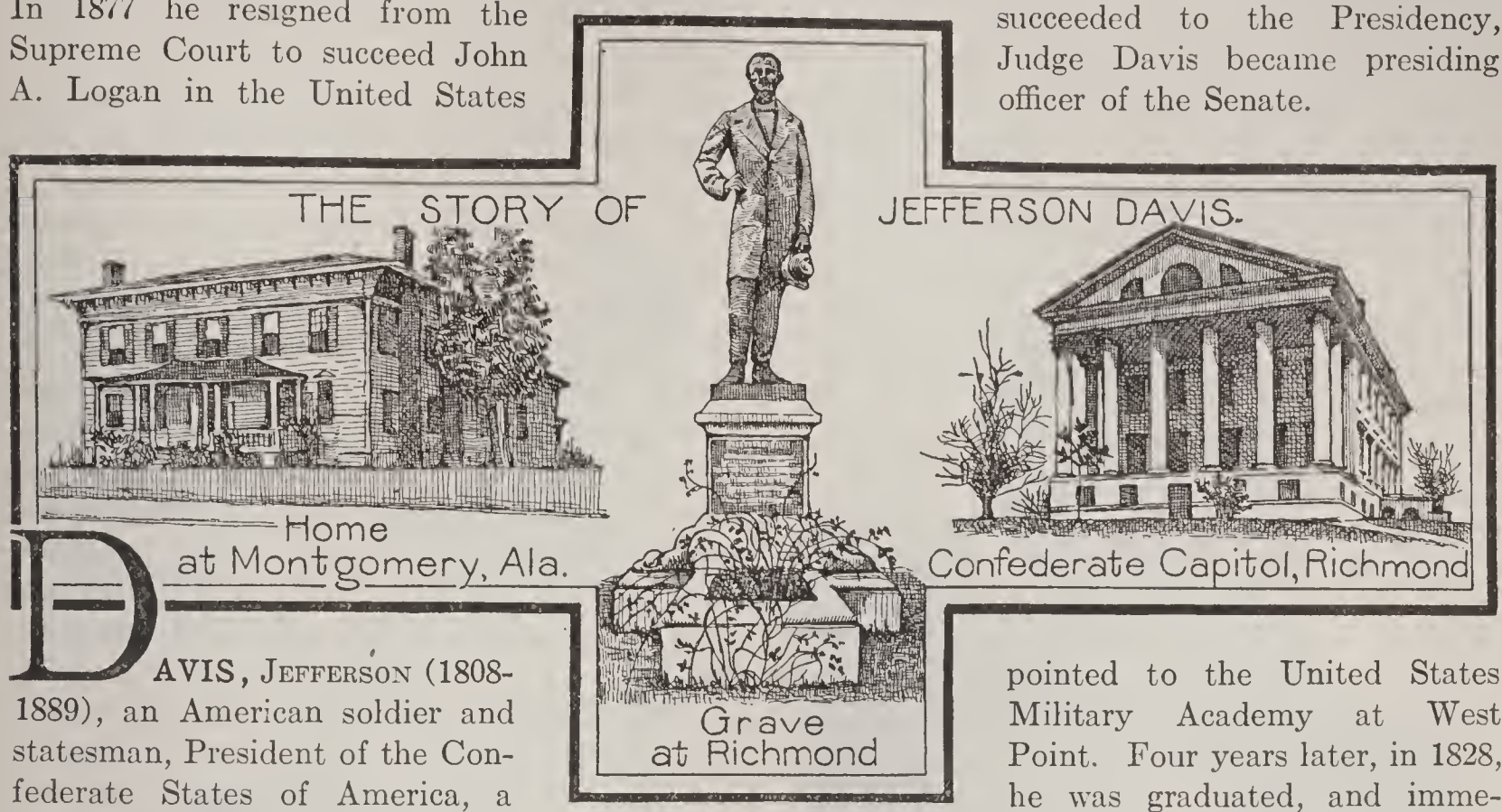
DAVID, JACQUES LOUIS (1748-1825), a French painter, known as the father of the modern French school of painting. Among the celebrated paintings that he completed while studying in Rome were the *Death of Socrates* and the *Oath of the Horatii.* During the French Revolution he was the artistic decorator of the national fetes which were founded on classic customs. In 1789 he completed the painting of Brutus condemning his sons to death, and in 1799 executed *The Rape of the Sabines,* receiving, it is said, 100,000 francs from its exhibition. He was directed by the emperor in 1804 to execute four commissions, and among the paintings executed in response to this order, *Napoleon's Coronation* remains distinguished. During the Reign of Terror he was a zealous member of the Jacobin party, and at the trial of King Louis XVI, sitting as one of the judges, he voted for his death. For this act he was banished to Brussels, where he died in exile in 1825.

DAVIES, *da'veez,* SIR LOUIS HENRY (1845-), a Canadian barrister, statesman and jurist, puisne judge of the Dominion Supreme Court since 1901. He was born at Charlottetown, Prince Edward Island, attended the Prince of Wales College in that city and studied law at the Inner Temple, London, England. He was called to the bar of Prince Edward Island in 1867, in 1875 and 1876 was leading counsel for the tenants before the commission which settled the land question in Prince Edward Island, and in the next year was counsel for Great Britain before the International Fisheries Arbitration Commission. Many years later, though better known as a political leader, his legal ability was recognized by appointment to the Joint High Commission which met in 1898 and 1899 for the settlement of all disputes between Canada and the United States.

Sir Louis's political career began in 1869, when he was for a short time solicitor-general of Prince Edward Island. From 1872 to 1879 he was a member of the provincial assembly, part of the time leader of the Liberal opposition, and from 1876 to 1879 was premier and attorney-general. He was elected to the Dominion House of Commons in 1882, and served without interruption until 1901, when he accepted appointment to the Supreme Court. From 1896 to 1901 he was Minister of Marine and Fisheries in the Laurier Ministry. In this capacity he undertook several diplomatic missions, notably in 1896, when he went to Washington in the interest of reciprocity, and in 1897, when he was joint delegate with Sir Wilfrid Laurier for the settlement of the Bering Sea Controversy (which see). He was created a Knight Commander of the Order of Saint Michael and Saint George by Queen Victoria in 1897. G.H.L.

DAVIS, DAVID (1815-1886), an American statesman and Supreme Court justice, the personal friend of Abraham Lincoln, of whose estate he was executor. Davis was born in Maryland. After his graduation from Kenyon College, Gambier, O., he studied law, beginning practice at Bloomington, Ill. In 1844 he was elected to the Illinois legislature; after 1848 he served as judge of the circuit court for three terms, and in 1862 was appointed by President Lincoln to the Supreme Court. Though he usually voted with the Democrats,

Judge Davis was nominated for the Presidency in 1872 by the National Labor Reform Party. In 1877 he resigned from the Supreme Court to succeed John A. Logan in the United States Senate, and held the office until 1883. When, on the death of Garfield, Vice-President Arthur succeeded to the Presidency, Judge Davis became presiding officer of the Senate.



DAVIS, JEFFERSON (1808-1889), an American soldier and statesman, President of the Confederate States of America, a man who "in his person and history symbolized the solemn convictions and tragic fortunes of millions of men." The people of the South remember with admiration his gallant service on the battlefields of Mexico; they are glad to recall his career in the United States Congress in the House and Senate, where he proved himself worthy to be grouped with Clay, Webster, Calhoun and the other "giants" of an illustrious period; they are proud of his record as head of the War Department during the Presidency of Franklin Pierce, and they cherish the memories that cluster about his stainless life and character. But more than this, Jefferson Davis won a place in their hearts that possibly no other man can fill. For his people he went to prison; for them he endured hatred, slander and ill-treatment. For this he has won their undying love.

He was born June 3, 1808, in that part of Christian County, Kentucky, which was later organized as Todd County. The Baptist church of the little town of Fairview now occupies the site of the house in which he was born. His father, a veteran of the American Revolution, was of Welsh descent; his mother came of Scotch-Irish ancestry. During the infancy of the boy the family removed to Wilkinson County, Mississippi, the state with which his fame will forever be associated. He completed the course of study in the county academy, then entered Transylvania College, Kentucky, and at the age of sixteen was appointed to the United States Military Academy at West Point. Four years later, in 1828, he was graduated, and immediately entered active army service with the rank of lieutenant.

Assigned to duty out on the northwestern frontier, Davis took part in the campaigns against the Indians, and was present at the capture of Black Hawk. Resigning from the army in 1835, he married the daughter of Zachary Taylor, and settled down to the quiet life of a Mississippi cotton planter. Four months after his marriage he lost his wife by fever, and he himself barely escaped the same fate. As soon as he had recovered he traveled for about a year in order to restore his health. In 1836 he returned to his plantation, where he spent several years in farming, reading and studying political economy and political philosophy, and by careful management he acquired considerable wealth.

In 1843 Davis entered the field of politics and in 1845 he was elected to the national House of Representatives. From the beginning of his political career he stood firmly for strict construction of the Constitution, and he gave his loyal support to John C. Calhoun.

During his term of office hostilities with Mexico commenced, and in June, 1846, Davis resigned his seat in Congress and took command of a regiment of Mississippi volunteers, as its colonel. He served in Mexico under General Taylor, distinguishing himself for gallantry in the battles of Monterey and Buena Vista. In the latter engagement he fought all day long with a bullet in his foot, and returned home after the war on crutches.

In 1847 the governor of Mississippi appointed Davis successor to a United States Senator who had died; the following year he was elected by the Mississippi legislature for the remainder of the term, and in 1850 for a full term. In that year the famous compromise measures fathered by Henry Clay came before the Senate. Davis took an active part

JEFFERSON DAVIS
Soldier, statesman and President of the Confederate States of America.

in the debates, arguing against the measures and coming frequently into opposition with Senator Douglas of Illinois, whose theory of squatter sovereignty he held to be unsound. In 1851 he resigned from the Senate to become the candidate of the States'-Rights Democrats for the governorship of Mississippi, and was defeated by a small majority after a stirring campaign that attracted the attention of the nation.

In 1853, at the beginning of the administration of Franklin Pierce, Davis was appointed Secretary of War, and for four years performed the duties of that office with distinction. He introduced an improved system of infantry tactics, brought about the substitution of iron for wod in gun carriages, effected an increase in the army, organized engineer companies to explore the proposed routes for a railway connecting the Mississippi Valley with the Pacific Ocean and strengthened the coast and frontier defenses. At the close of his term of office he was reëlected to the Senate, where he became the recognized spokesman of the South and the champion of the doctrine that a state has the right to choose and maintain its own institutions, without interference from the general government. Calhoun, the great defender of the states' rights theory, had passed away, but the Southern cause found an able and eloquent champion in the Senator from Mississippi.

With the election of Abraham Lincoln to the Presidency of the United States, the anti-slavery struggle reached a crisis, and when Mississippi passed the ordinance of secession, Davis resigned from the Senate. His last speech, delivered on January 21, 1861, was a noble expression of his belief in the righteousness of the Southern cause, and yet it was with sincere regret that he bade his associates farewell.

Shortly after his return to Mississippi he received news of his election as provisional President of the Confederate States. He was inaugurated on February 18, 1861, and a year later was elected permanent President. His career as chief executive showed his ability and his high sense of honor and of duty; the labors and trials he endured are faithfully portrayed in his *Rise and Fall of the Confederate Government,* published in 1881. Throughout the war he acted with dignity, sincerity and devotion to principle, and he endeavored with

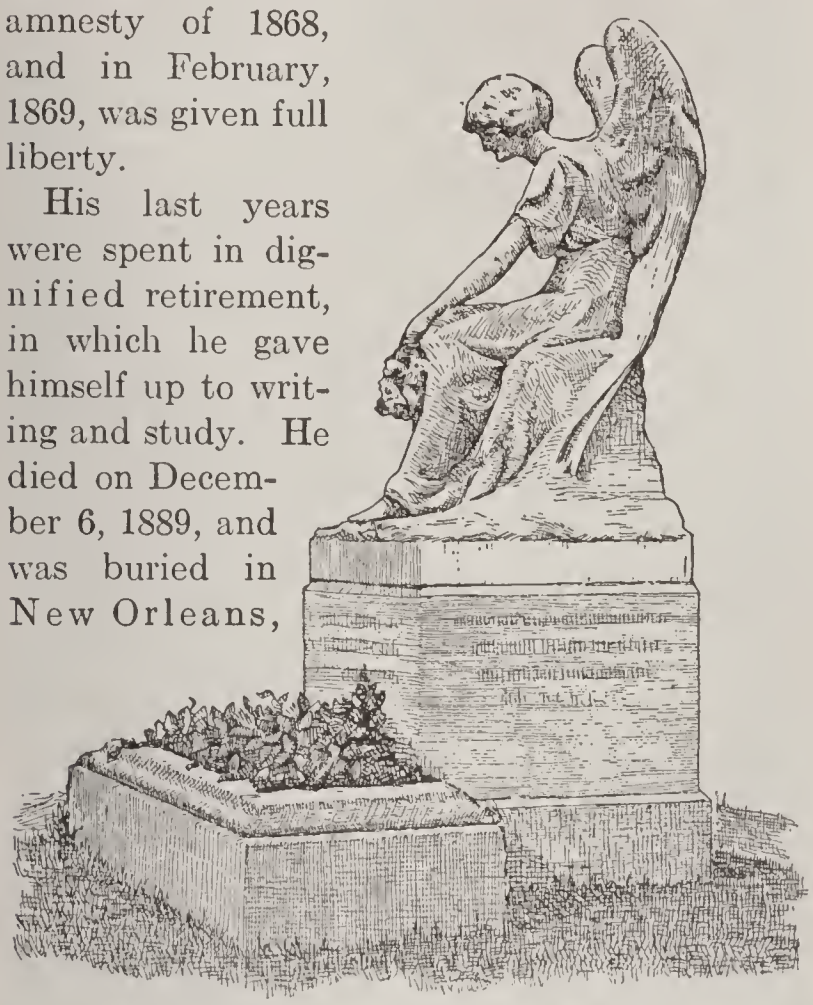
HOME OF JEFFERSON DAVIS AT BEAUVOIR
In 1879 Mrs. Dorsey, of Beauvoir, Miss., bequeathed her estate to Mr. Davis, and here he lived quietly for the ten years preceding his death.

all the force of his nature to lessen the suffering that was an inevitable feature of the bitter struggle.

Soon after the surrender of General Lee, Davis was taken prisoner and was confined in

Fortress Monroe. A Virginia grand jury indicted him for treason, and for two years he remained in prison, unable to secure a trial. In 1867 he was released on bail, Horace Greeley and other prominent Northern men qualifying as bondsmen. He was included in the general amnesty of 1868, and in February, 1869, was given full liberty.

His last years were spent in dignified retirement, in which he gave himself up to writing and study. He died on December 6, 1889, and was buried in New Orleans,



IN MEMORY OF WINNIE DAVIS
The monument to the "Daughter of the Confederacy," at Richmond.

but in 1893 his body was removed to Richmond, where a monument has been erected to his memory. In the same city is a monument to his daughter Winnie. In 1844 he had married a daughter of William B. Howell, son of Governor Howell of New Jersey. This gifted woman, whose noble spirit matched her husband's, wrote an excellent biography of the great Southern leader. E.C.B.

The following books will be interesting to those desiring a fuller account of Jefferson Davis' experiences: Craven's *Prison Life of Jefferson Davis,* and the biographies of Dodd and Alfriend.

Related Subjects. The following articles in these volumes will make more clear certain phases in the career of Jefferson Davis:

Black Hawk
Calhoun, John C.
Compromise of 1850
Confederate States of America
Fort Monroe
Mexican War
Monterey, Battle of
Nullification
Secession
Squatter Sovereignty
States' Rights
War of Secession

DAVIS, Rebecca Harding and Richard Harding, mother and son, two writers who have won distinction in current American literature.

Rebecca Harding Davis (1831-1910) was the wife of L. Clarke Davis, editor of the Philadelphia *Inquirer.* Her first story, *Life in the Iron Mills,* published in the *Atlantic Monthly* in 1861, attracted wide attention because of its realism, and it marked the introduction of a new theme in American fiction—the labor question. She contributed to several current publications, notably *The Youth's Companion,* winning fame through her interesting stories for young people. Among her books are *A Law Unto Herself, Kitty's Choice, Dallas Galbraith, Kent Hampden* and *Bits of Gossip.*

Richard Harding Davis (1864-1916) held high rank among modern short-story writers and as a war correspondent. He was born in Philadelphia, Pa., and was educated at Johns Hopkins and Lehigh universities. His real foundation for his literary work, however, came in his experience as a reporter in Philadelphia and as a war correspondent for the London *Times* and the New York *Herald* in the Turkish-Greek, Spanish-American, Boer and Russo-Japanese wars and in the early months of the War of the Nations. While on the latter assignment he proved himself one of the greatest of war correspondents. He was a trained and alert observer, and drew his word pictures with bold and telling strokes, revealing a keen sense of the dramatic and a gift for vigorous and picturesque phrasing.

RICHARD HARDING DAVIS

Among the best-known of his stories are *Ranson's Folly,* a tale of the adventures of a young officer at a United States army post, and *The Bar Sinister,* a remarkable story of a dog. Other notable titles are *Van Bibber and Others, Soldiers of Fortune, Captain Macklin, The Man Who Could Not Lose* and *The Lost Road.* His books of travel and stories of his war experiences, which have all the admirable qualities of his fiction, include *Cuba in War Times, With Both Armies in South Africa* and *The Congo and the Coast of Africa.* He has also written several plays, among which are *The Taming of Helen, The Dictator* and *Blackmail.*

DAVITT, *dav'it,* Michael (1846-1906), an Irish political leader, founder of the Irish Land

League. His parents had been evicted from their home for non-payment of rent when he was a child. This event embittered his whole life, and aroused in him a hatred of everything English. While working in a cotton mill in Lancashire he lost his right arm. He found work, however, in a printing office and educated himself in his spare time. He visited America several times to obtain assistance in the organization of the Land League, and in 1870 was sentenced to fifteen years' imprisonment for bringing arms into Ireland. Liberated in 1877, he still continued his bitter campaign against landlordism and was again imprisoned. He was elected to Parliament on several occasions, but was refused admission. Later he was returned unopposed, but bankruptcy necessitated his resignation. He was a prolific writer, but his bitterness shows clearly in all his works. His writings include *Defense of the Land League* and *Leaves from a Prison Diary.*

DAVY, *da'vi,* Sir Humphry (1778-1829), an English chemist whose invention of a safety lamp for use in mines is one of the greatest gifts of science to mankind. At the age of twenty-two he was appointed lecturer to the Royal Institution of London, and a year later was made its professor of chemistry. His researches and experiments gained for him a great reputation. At a time when England and France were at war he was invited to visit the latter country, and there he was received with the greatest respect. He was knighted and married a lady of great wealth, and was thus enabled to devote all his energies to scientific research. He decomposed potash, soda and strontia and set free the metals which form the base of this large group of compounds. This achievement placed him above all other chemists of his time. After thoroughly investigating fire damp, he produced the Davy lamp, which made miners comparatively safe from explosions.

DAW'SON, or **DAWSON CITY,** the seat of government for Yukon Territory and the commercial center of the Klondike region. It is located on the right bank of the Yukon River, at its confluence with the Klondike. It is about fifty miles east of the Alaska boundary, and 360 miles in a straight line northwest of Skagway. A railway is in operation to Bonanza, twelve miles distant. During the summer months steamers run from Dawson to White Horse, 460 miles southeast, the head of navigation on the Yukon River and the terminus of the White Pass and Yukon Railway, and in winter there is connection overland by sleighs and stage coaches.

Dawson owes its existence to the discovery of gold on Bonanza Creek on August 16, 1896. A town sprang up almost over night, and when the gold rush was at its height its population was not far from 20,000. The town is still the receiving and supply center for the Klondike, and in many ways is a typical mining center, though there has never been, even in the feverish days of 1896 and 1897, lawlessness and violence to the extent usually characteristic of such communities. Order is maintained by the Royal Northwest Mounted Police. Dawson was incorporated in 1899, surrendered its charter in 1903, and was again incorporated in 1914. It was named for George M. Dawson, a distinguished Canadian geologist (see below). Population, 1911, 3,013; 1921, about 2,000. G.B.

DAWSON, Sir John William (1820-1899), a Canadian geologist and educator, for nearly forty years principal of McGill University, which attained high rank under his administration. He was born of Scotch parents at Pictou, in Nova Scotia, and went to Scotland to study at the University of Edinburgh, from which he was graduated in 1842. After his return to Canada in that year he accompanied Sir Charles Lyell on several geological expeditions, and made a special study of the fossil forests of the coal measures of Nova Scotia. From 1850 to 1853 he was superintendent of education for that province, and in 1855 became professor of geology and principal of McGill University, which became, largely through his efforts, one of the leading universities of America. Though he did not resign this position until 1893, he found time to write a score of of books and scientific monographs. In the field of Canadian geology he became a recognized authority. Among his published works are *Acadian Geology; Air-Breathers of the Coal Period; The Dawn of Life; The Canadian Ice Age,* and *The Story of the Earth and Man.* Dawson was the first president of the Royal Society of Canada.

His son, George Mercer Dawson (1849-1901), was also distinguished as a geologist and explorer. He was born at Pictou, and was educated at McGill University and the Royal School of Mines, London. In 1873 he was appointed geologist and naturalist to the North American Boundary Commission, and in 1875 became a member of the staff of the geological survey of the Dominion, later becoming assistant director and in 1895 its director. He was

in charge of the Canadian government's Yukon survey in 1887, and Dawson City is named for him. In 1891 he took an important part in the arbitration of the controversy regarding the seal fisheries in the Bering Sea. He was the author of many scientific papers and reports, especially on the surface geology and mineral formations of Northern and Western Canada. G.H.L.

DAY, the period of time required for the earth to make one revolution on its axis, or twenty-four hours. In law a day is generally considered to extend from midnight to midnight, but a *business* day includes only the business hours customary in any given locality. Also, *day* may mean the period during which the sun is shining upon a given portion of the earth, or the period of daylight. The light is called *day* and the darkness *night*. In the temperate and the polar regions the days and nights vary in length; at the equator they are of equal length. See SEASONS.

For business and all other ordinary purposes in most parts of the world the day of twenty-four hours is divided into two periods, the forenoon (A. M.) extending from midnight to noon, and the afternoon (P. M.) extending from noon to midnight. The railroads in Western Canada arrange their schedules on a twenty-four hour day, numbering the hours from one o'clock A. M. to twenty-four o'clock. The twenty-four hour day is also official in France.

Astronomers use a day measured by the time required for the earth to make a complete revolution on its axis in reference to a fixed star. Since the star is so far away that the movement of the earth in its orbit is practically unnoticeable in reference to it, this day is a little shorter than our civil day of twenty-four hours. It is exactly 23 hours, 56 minutes, 4.098 seconds, and is known as the *sidereal* day. Instead of writing 1 P. M., the astronomers would write the *thirteenth hour.*

The Babylonians began the day at sunrise, the Jews at sunset, and the Egyptians and Romans at midnight. The Chinese divide the day into twelve periods of two hours each.

DAY, WILLIAM RUFUS. See illustration, with biography, in article SUPREME COURT.

DAYLIGHT SAVING, a plan for conserving fuel, practiced in Europe and adopted in the United States in 1918 for one year. Under the law clocks were turned ahead an hour on the last Sunday in March and turned back again on the last Sunday in October. All people pursued their usual activities by clock time, ignoring the actual change, and no embarrassment resulted. While conservation was the result sought, the daylight saving was welcomed by workers, but was very strongly opposed by farmers. Officially, the time from March to October was known as summer time; from October to March, winter time. Pressure upon Congress in 1919 caused repeal. Many cities, however, have adopted daylight saving independently.

DAY LILY, a hardy, sun-loving, lilylike plant whose beautiful tawny-orange, white or blue-lilac blossoms live but from the rise of sun to its setting. So the appropriate family name, *Hemerocallis,* from the Greek, meaning *beautiful for a day,* suggested the popular name.

Long leaves, in some species grasslike, spring from fleshy, fibrous roots. The flowers appear in loose clusters at the top of a leafless stalk three to five feet high, six or twelve in a cluster, two or three opening each day. They are funnel-shaped, like a lily, six-parted, with six stamens and long-stalked, heavily-pollened anthers. Day lilies are hardy, easy to cultivate, and in good rich soil in a moist shady spot make excellent border plants, giving a wealth of blossoms from June to September.

DAY'TON, OHIO, a leading manufacturing city and the county seat of Montgomery County. It is situated in the southwestern part of the state, on both banks of Great Miami River, at the point where it receives the waters of Mad River; it is also on the Miami & Erie Canal. Cincinnati is sixty miles southwest, Columbus is seventy-two miles northeast, and Toledo, 147 miles slightly northeast. The city is served by the Cleveland, Cincinnati, Chicago & Saint Louis; the Cincinnati, Hamilton & Dayton; the Pennsylvania; the Dayton & Union, and the Erie railways; and seven electric lines center here. The rivers are spanned by five concrete bridges. Dayton has a growing population, chiefly American, which increased from 116,577 in 1910 to 153,830 in 1920. The area exceeds fifteen and a half square miles.

Industrial Enterprise. Dayton, though fifth in population among the cities of the state in 1920, ranked third in invested capital for manufacturing, in the value of manufactured products and in the number of workmen employed. One of the chief factors of prosperity is the abundant water power afforded by Mad River, through hydraulic canals. The surrounding country is an agricultural district, fruits, vegetables and tobacco being extensively

cultivated. Limestone and marble quarries produce large supplies of excellent building material. Dayton's manufacturing industries are numerous, varied and extensive; many factories employ from 500 to 2,500 people. The National Cash Register Company and the railroad car factories lead in extent of manufacture. Agricultural implements, architectural iron work, sewing machines, foundry products, automobiles, computing scales, paper, cotton and woolen goods and linseed oil are other important products.

Homes, Parks and Boulevards. Dayton is an attractive city that suggests the home-lover. There are a dozen or more building associations, its interest in these institutions being greater than that of any other city of its size. A large number of $20,000 homes have been built by this method. Its streets are broad, some being 180 feet wide; Miami and Robert boulevards and the park boulevard along the river are especially attractive. Dayton's park system covers an area of about 700 acres and includes Cooper, Van Cleve, McKinley and McCabe parks and White City. There is also access to the grounds (640 acres) of the National Military Home, which accommodates about 6,000 war veterans. A handsome soldiers' monument is one of the attractions of the city.

Buildings and Institutions. The most notable buildings are the Federal building, erected in 1913 at a cost of $1,000,000, the Union Station, opened to the public in 1900, the old courthouse, modeled after the Parthenon, with a large annex, and Memorial Hall. Dayton State Hospital, the insane asylum, Miami Valley Hospital and Saint Elizabeth's Hospital are among the benevolent institutions. The Y. M. C. A. building cost $600,000. There are about 100 churches, many of them of unusual architectural beauty, and some fine hotels, bank and office buildings.

Education. Besides its public school system the city has Notre Dame Academy, Saint Mary's College, Bonebroke Theological Seminary, Central Theological Seminary, a manual training school, twelve parochial schools for Roman Catholics and Lutherans and four business colleges, one of which was established in 1860. The first library incorporated in the state was established at Dayton in 1805. The public library and museum, in Cooper's Park, contains 100,000 volumes and is supplemented by two branch libraries.

History. In November, 1796, the present city of Dayton was laid out by General Israel Ludlow and a party of Revolutionary soldiers. It was incorporated in 1805 and named for General Jonathan Dayton, one of the first settlers. The city charter was granted in 1841. An epidemic of cholera visited Dayton in 1849, and it has been damaged by floods several times; the most serious disaster from this source occurred in March, 1913, when the city sustained a loss of $128,000,000. Within two weeks a fund of $2,000,000 was raised by public-spirited citizens for flood prevention. A plan is under way to obviate even lesser dangers throughout the Miami Valley by a system of dry reservoirs, the construction of which will cost about $20,000,000. Dayton adopted the commission form of government in 1913. Five elective officers appoint a city manager, who is personally responsible for the administration of the government (see CITY MANAGER). W.G.L.

DEACONESS, *de'k'ness,* a member of a religious Order connected with several of the Protestant churches. The Order is composed of women who devote their lives to serving the people under the direction of the Church, in special fields in which pastors cannot work. They have definite centers of work called *deaconess homes,* where they live as communities and where those who need their services are always able to find them. Their chief duties consist in nursing the sick who cannot pay for such assistance and in ministering to the spiritual and material necessities of the distressed and needy. The members usually wear a distinguishing costume, though it is inconspicuous, but they do not take any vows as to time of service. They are required to take a two-years' course of study in special training schools to prepare them for their work and are inducted into the Order by the authorities of the Church to which they belong.

The deaconess movement was inaugurated in modern times in the first half of the last century by Pastor Fliedner of the United Evangelical Church of Prussia. The first deaconess home in America was established by the Lutheran Church in New York in 1852. The next was founded by Saint Andrew's Episcopal Church in Baltimore in 1855. In 1888 the General Conference of the Methodist Episcopal Church authorized the establishment of the Order, and the first Methodist deaconess home was founded in Chicago. The Order was given a warm welcome by this Church, which now is far in the lead of all other denominations in deaconess work.

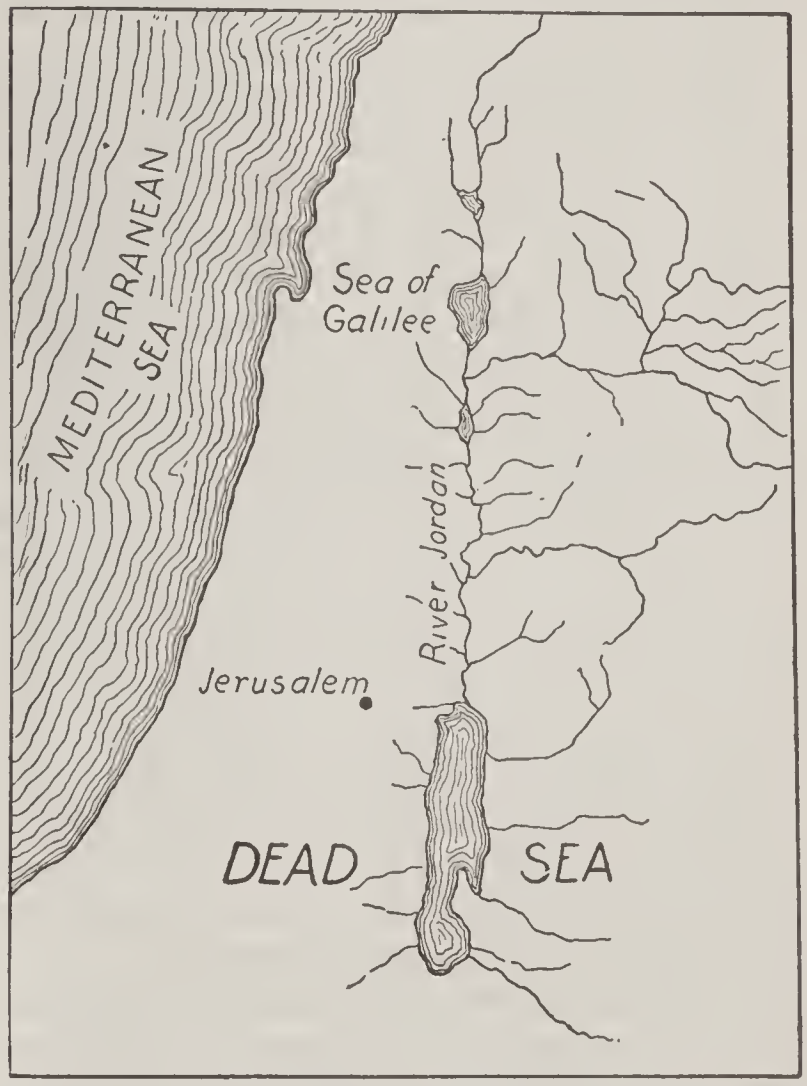
DEAD-LETTER OFFICE, a division of the Postoffice Department of a country, where all mail matter which is unclaimed or cannot be delivered is sent from the local post offices throughout the country. This matter includes letters and packages which have remained for one month uncalled for; all that are imperfectly addressed or are without stamps, unless sender is known; also all articles barred from the mails—liquids, live animals and explosives. Excluded from the above are all pieces of undelivered mail matter which bear the names of the senders and can thus be returned to them.

The amount of mail matter which the Dead-Letter Office of the United States receives runs into millions of pieces annually. Statistics for a recent year show that 7,500,000 pieces of undeliverable mail were sent to the Dead-Letter Office, 5,400,000 of this number being letters and parcels. Over 250,000 of the letters contained money, checks, notes and money orders. Of these the government, by opening letters and packages, was able to return to the senders sums amounting to $1,150,000. There was still left in the government's hands $15,000, which was added to the revenue of the postal department because its ownership could not be established. Over 4,000,000 pieces were destroyed because they were without names. Thousands of misdirected magazines and newspapers are distributed among the hospitals of Washington yearly.

This department of the postoffice is under the control of the First Assistant Postmaster-General. Until January 1, 1917, the Dead-Letter division was controlled entirely from Washington, but on that date three branches were established—at New York, Chicago and San Francisco—to handle all dead-letter material within specified zones.

DEAD SEA, a salt lake or sea in the southeastern corner of Palestine, wholly unlike any other body of water in the world. It lies at the bottom of the deepest "fault" or fracture of the earth's surface in the world—1,310 feet below sea level. The River Jordan, the most noted stream in history, flows into it from the north through a rapidly descending valley. On the east the white limestone walls of the plain of Moab rise abruptly 4,400 feet above it, while the plateau of Judea towers half that height on the west.

The lake itself is about forty-seven miles long and ten miles wide, with an area of 300 square miles. The water contains about twenty-five per cent of solid matter, chiefly common salt, which is practically double the percentage of salt in the Great Salt Lake, Utah. It is nearly six times as salt as the ocean and so dense that a human body will float on the surface. Although the Jordan pours several million gallons of fresh water into the Dead Sea every day and the sea itself has no outlet, the water never rises any higher and never grows less salty. This condition is due to evaporation, because the heat in this deep cleft of the earth is very intense. There is not a vestige of animal life in the sea or in its vicinity, and no vegetation can grow there. Sulphur and rock salt and lava strew its shores. Poisonous gases escape from its surface, and



LOCATION MAP

the water is ill-smelling. Altogether there is no place in the world more utterly desolate and repelling. So much has this been recognized that "Dead Sea" has become a synonym for evil and bitter disappointment.

It has a long history, dating away back into earliest ages. The tradition of its formation may be read in *Genesis,* where it is told that the wicked cities of Sodom and Gomorrah were destroyed, after the escape of the righteous Lot and his family, by a rain of fire and brimstone (perhaps a volcanic eruption) and that they were covered up by the "Salt Sea." To this day the Arabs call it *Bahr Lut*—sea of Lot.

DEAF AND DUMB, or **DEAF-MUTES,** are those persons who can neither hear nor speak. Those who are born deaf or become so in infancy suffer from the additional affliction of dumbness because they cannot hear others speak, and therefore do not learn to articulate words. Mutes of this class are to be distinguished from those whose lack of speech results from defects of the speech centers in the brain, or from imperfect organs of articulation. When deafness comes upon those who have already learned to talk they retain the power of speech, though the voice often becomes harsh and unnatural. Mutes who are taught to articulate words do not acquire a perfectly-natural speaking voice, the rising and falling inflections which give variety to the speech being more or less absent.

Causes of Deafness. The deaf are grouped into two classes—those who are born deaf and those who lose their hearing after birth. The former are afflicted with what is called *congenital* deafness, or deafness from birth; the latter with *accidental,* or *acquired,* deafness. In the first case the harm is done before the birth of the child, who suffers from what is known as arrested development. In some instances, physicians agree, this condition exists as a family trait, due to alcoholism, insanity or certain forms of disease, notably syphilis, and the deafness is transmitted by heredity. The intermarriage of near relatives, who inherit similar tendencies to disease, is a very common cause of deafness at birth. It is estimated that about twenty-five per cent of the deaf-mutes of France and ten per cent of those in the United States, Canada and England are the children of near-related parents.

Acquired deafness, which occurs at all ages, may be permanent or temporary, partial or complete. Sometimes only one ear is affected, in which case the person is not seriously handicapped. Acquired deafness is often a process of slow development, the hearing failing gradually and perhaps never ceasing wholly, though the sufferer may hear with difficulty.

These varying conditions are due chiefly to (*a*) deposits of wax in the ear, which touch the membrane of the drum; (*b*) inflammation of the lining membrane of the canals (Eustachian tubes) that lead from the upper part of the throat to the middle ear (see Ear, subhead *Middle Ear*); (*c*) piercing of the drum membrane; (*d*) disease of the middle ear, causing the joints of the small bones of the ear (ossicles) to stiffen and interfering with their movements; (*e*) disease of the auditory nerve or of the brain, whereby some of the auditory centers are affected; (*f*) other diseases, such as spinal meningitis, scarlet fever, measles or mumps, which affect the middle ear. Sometimes a violent blow upon the ear causes deafness by rupturing the drum, and a constant noise, as that in a machine shop or the incessant roar of battle, may produce loss of hearing by overstimulating the auditory nerve.

The Education of Deaf-Mutes. *Historical.* Shut in within himself and unable to communicate freely with his fellows, the deaf-mute of early historical times was a pitiable object, considered by the law to have no more intelligence than a madman. The Greeks and Romans put their deaf-mutes out of the way as so many useless encumbrances, and in France the parents of these unfortunates regarded them as a family disgrace and shut them up in convents and asylums. It would seem that Christ was the first to have compassion on these defectives, for among His works of mercy were the opening of the ears of the deaf and the loosening of the tongues of the dumb.

DEAF AND DUMB ALPHABET
For one hand.

Probably the first person who attempted to educate the deaf was an English bishop of the seventh century, who, according to a story told by the Venerable Bede, performed a miracle by teaching a deaf-mute to talk. Then, after a lapse of many centuries, an Italian philosopher, Jerome Cardan (1501-1576),

aroused the interest of the public in the subject by declaring, authoritatively, that "written characters and ideas may be connected together without the use of sounds." Cardan also pointed out that deaf-mutes were normal beings in intelligence. Shortly after this a Spanish Benedictine monk gave regular instruction to the deaf and dumb, whom he taught, as he said, "to speak, read, write, reckon, pray, serve at the altar, know Chris-

DEAF AND DUMB ALPHABET
For two hands.

tian doctrine and confess with a loud voice." Another Benedictine monk, Juan Bonet, published in 1620 what is probably the first treatise on the education of deaf-mutes. These pioneer teachers used signs, pantomime and finger-spelling.

In 1648 the first English treatise on the subject was published by Dr. John Bulwer, and the movement in Europe was fairly started with the establishment of a school for poor deaf-mutes in Paris, in 1760. The founder of this school, Charles-Michel de l' Epée, is one of the greatest benefactors the deaf have ever had. Eighteen years later the first public institution was opened in Leipzig. It was not until early in the nineteenth century, however, that the education of the deaf and dumb was placed on a systematic, organized basis. At the present time institutions for the deaf are maintained in practically every country in Europe, and a few schools have been opened in Japan and China.

In America, Connecticut led the way, the first permanent school for the instruction of the deaf being opened at Hartford in 1817. A few years previous to this an unsuccessful attempt had been made to found such a school in Virginia. New York and Massachusetts were the next states to begin the systematic education of deaf-mutes, and now every state in the Union has one or more institutions in which they receive instruction. Public day schools for the deaf are maintained in California, Georgia, Illinois, Massachusetts, Michigan, Missouri, New Jersey, New York, Ohio, Oregon, Texas, Washington and Wisconsin. In the number of deaf-mute institutions the United States leads the countries of the world, with over 150 state institutions, public day schools and private schools. Some authorities believe that the deaf and the hearing should be taught together in the same school, interesting experiments along this line having been made in Chicago, Milwaukee and New York.

Schools for the deaf are maintained in several cities of Canada, particularly Montreal, Quebec, Toronto, Winnipeg and Victoria.

Attention is also being given to the development and training of the residual hearing that exists in the cases of very many so-called deaf-mutes. This is, perhaps, their most valuable possession, as it supplies the only normal means of access to the speech centers of the brain. It has been found by patient effort that an amount of hearing so slight as to be overlooked by the average physician and parent can be so educated as to develop in the child's brain a considerable ability to interpret speech by ear and to modify the speaking tones.

Methods of Instruction. The education of the deaf and dumb is carried on by means of two general methods, the *sign* and the *articulation* methods. When the former is used, ideas are communicated through the medium of gesture, facial expression and pantomime, and by means of the manual alphabet, whereby the pupil is taught to spell with his hands. The two forms of the manual alphabet, the one-handed and the two-handed, are shown in the accompanying illustrations.

The articulation method is used both in teaching the deaf-mute to understand what is said to him and in teaching him to speak. By watching the motions of the lips of his teacher, he learns to interpret what is said, though he cannot hear the words. This method of interpretation is known as lip reading. One who has acquired a mastery of it can understand a public lecturer, if he is not too far from the speaker, and also the utterances of the actors in a moving-picture play. Those who have

always heard can scarcely appreciate what the mastery of lip reading means to a deaf person in just the ordinary routine of life. Experience has demonstrated the truth of what theory indicates, that the best results in speech and lip reading cannot be attained by the deaf when any use is made of the sign language or finger spelling during the educational period. For this reason the use of silent methods of communication is steadily decreasing in the schools for the deaf, and in ninety-five of the schools in the United States no use whatever is made of the sign language or finger spelling.

Mutes are taught to speak by observing the lips and other vocal organs of the teacher, and then imitating the motions. When certain sounds are pronounced the pupil touches the teacher's throat, thus being better able to imitate the vibration and position of the muscles. The Wright Oral School of New York City is one of the best oral schools for the deaf.

The Bell system, invented by A. Melville Bell of Edinburgh and introduced into America in 1872 by his son Alexander Graham Bell, consists of a series of alphabetical characters based on the position of the vocal organs when they are in motion. These characters suggest to the eye the mechanical process of speech in the formation of all the sounds that can be uttered.

For many years after schools for the deaf were established, pupils were not admitted until they were eight or ten years of age. Gradually it was realized that school instruction should begin at about five years of age, but the years between birth and school age were practically wasted, from the standpoint of language acquisition. Recently, a body of literature has become available for the instruction and guidance of parents of deaf children in their training at home before they are of school age. Among works of this character are John D. Wright's *What the Mother of a Deaf Child Ought to Know,* and late volumes of the *Volta Review,* published in Washington, D. C., by the Volta Bureau.

What can be accomplished in the education of the deaf and dumb is strikingly shown in the achievement of Miss Helen Keller. Though deaf and dumb from infancy and blind after the age of nineteen months, she is a college graduate and successful writer, and is a lecturer of note. J.D.W.

Consult Garrett's *Directions to Parents of Deaf Children;* Bell's *Deaf Mute Instruction in Relation to the Work of the Public Schools.*

Related Subjects. The reader is referred to the following articles in these volumes:

Bell, Alexander Graham Keller, Helen Adams
Bridgman, Laura Dewey Sign Language

DEARBORN, Henry (1751-1829), an American soldier and physician, born at Northampton, N. H., distinguished as a Revolutionary hero, and honored by having Fort Dearborn, on the site of Chicago, named for him. On hearing of the Battle of Lexington on April 20, 1775, he marched to Cambridge, a distance of sixty-five miles, with a company of volunteers and was made a captain. He served at the Battle of Bunker Hill, accompanied Arnold to Quebec and was major under Gates when Burgoyne was captured. By a gallant charge at the Battle of Monmouth he distinguished himself and his regiment. In 1780 he took part in Sullivan's Indian expedition in Western New York and was in the final Yorktown campaign. He was twice a member of Congress, and was Secretary of War in Jefferson's Cabinet (1801-1809). Becoming a major-general in the War of 1812, he was honored as senior officer of the United States army until his honorable discharge in 1815. In May, 1822, he was sent as minister to Portugal, but at his own request was recalled after two years.

DEATH. In all plant and animal life there is a time when the vital functions cease to exist. This is called *death.* The physiologist says that the final cause of death in man is the stopping of the heart's action, which results in the arrest of the circulation and the death of the bodily tissues through lack of nourishment. The average person thinks of death as the final episode in the drama of life; comparatively, he pictures life as a long line, and death a mere dot at the end of it.

When Death Begins. As a matter of fact, death begins with birth, for throughout the span of life every part of the organism has its period of vitality and decay, and in continuous succession old cells are destroyed and new ones are formed in all the bodily tissues. Speaking figuratively, life and death are engaged in a struggle that ends only when death is finally victorious. Sometimes death is aided by disease, accident or violence, but even when man lives to old age, life must finally succumb to the forces of decay. This is the period, wrote the author of *Ecclesiastes,* "when the keepers of the house shall tremble, and the strong men shall bow themselves, and the grinders cease because they are few, and those that look out of the windows be darkened."

Its Meaning. Man, fascinated by the spiritual meaning of death, from the very beginning of time has formulated theories concerning the great "undiscovered country, from whose bourn no traveler returns." To the believer in the immortality of the soul death is what Longfellow expresses so beautifully in his *Resignation:*

There is no Death! what seems so is transition;
This life of mortal breath
Is but a suburb of the life elysian
Whose portal we call Death.

It is instinctive in human nature to believe that the soul lives again after the death of the body. For some of the theories which have had their origin in this belief, see IMMORTALITY; TRANSMIGRATION OF THE SOUL.

In Literature and Myth. In legend Death has usually been personified as the great enemy of mankind. Sisyphus, in the old Greek tale, bound Death in chains when he came to bear him away, and no one on earth died until Mars came and freed the captive. In Italian folklore stories Death is tied up in a bag and corked in a bottle by his enemies. A German variation of this tale occurs in the story of Gambling Hansel, who kept Death up a tree for seven years. In Chaucer's *Canterbury Tales* the story told by the Pardoner is that of three roysterers who planned to seek out Death and slay him because he had killed an old comrade of theirs.

Death and its various aspects have been a favorite theme of poets, and have inspired many passages of high lyric beauty. It is an interesting fact that poems treating of death nearly always sound the optimistic note, and are more courageous and cheerful in tone than many whose theme is life. This is notably true of such well-known poems as Bryant's *Thanatopsis* (whose title means *contemplation of death*), Browning's *Prospice,* Tennyson's *Crossing the Bar* and Stevenson's *Requiem,* and it is beautifully illustrated in the following lines from an English poet, William E. Henley (1849-1903):

So be my passing!
My task accomplished and the long day done,
My wages taken, and in my heart
Some late lark singing,
Let me be gathered to the quiet west
The sundown splendid and serene,
Death. B.M.W.

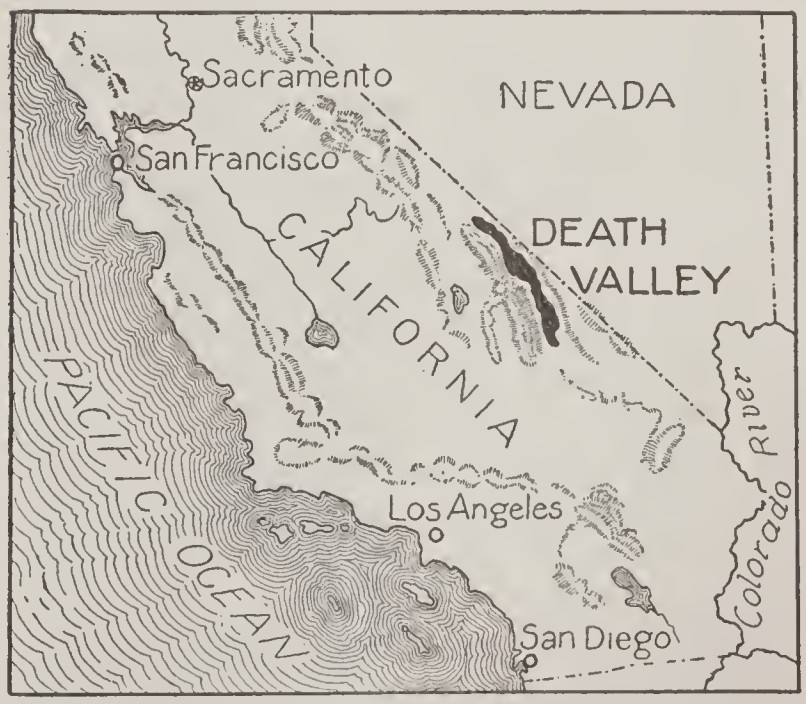
DEATH'S-HEAD MOTH, a moth of the interesting and beautiful family of sphinx moths, so named because of characteristic pale-yellow marks on the back of its thorax. The resemblance of these marks to a skull or death's head has given rise to many superstitious beliefs. The moth has a thick, hair-covered body, and wings that are strong, but soft and downy, and measure four or five inches across. The forewings are brown, spotted and marked; the hind ones are yellow, with two black bands. This beautiful night-flying creature often enters

DEATH'S-HEAD MOTH
This insect frequently grows to a size one-half larger than the illustration.

bee hives for honey. There its squeaking noise frightens the bees like the "voice" of the queen, so the moth is not killed or sealed up as are other robbers of hives.

The bright-yellow caterpillar of this moth, with its violet stripes and blue spots, feeds on leaves of potato and tomato plants, but does less harm than caterpillars of other species.

DEATH VALLEY, a sandy plain about 150 miles long and thirty-five miles wide, in Inyo County, Cal., close to the border of Nevada. The name was applied by a company of emigrants *en route* in 1849 to California's newly-



LOCATION OF DEATH VALLEY

discovered gold fields. Nearly all of this group of adventurers perished in the desert wastes. The plain is about 210 feet below the level of the sea and is destitute of vegetation, with the exception of cacti and greasewood. The

Panamint mountain range encloses it on the west and shuts out the Pacific winds. The Amargosa and Funeral mountains, suggesting its tragic story, constitute its eastern boundary, and volcanic ranges of a brown, yellow, black and red color make up the surrounding country.

These ranges furnish most of the borax used for commercial purposes (see BORAX). Summer heat rises frequently to 137° F., and on the mountain summits in the winter the thermometer often falls to 30° below zero. There is little animal life except the crow, buzzard, horned-toad, jackrabbit and rattlesnake. The wealth of the valley is purely mineral, quartz rich in gold having been found along the trail taken by the old emigrant parties, the "49-ers" referred to above. Silver, copper and lead have been found in paying quantities; and colemanite, taking its name from its discoverer, W. T. Coleman, has been found rich in borax. Human society in this valley consists principally of roving bands of Piute Indians and a few miners. Tourists should not attempt to cross this valley earlier than October nor later than April.

DEATHWATCH, a hard-bodied, red-brown beetle about a quarter of an inch long, which lives in the furniture and woodwork of houses. There, knocking its hard head on the wood to call to its mate, it produces the peculiar ticking sound which has caused superstitious people to believe that it is a sign of death. The larva (young) of a species of this beetle is the familiar, destructive bookworm (which see). A species of book-lice is also called deathwatch.

DEBATE. Chaucer, Spenser and other early English writers used the word *debate* in the sense of *fight* or *quarrel,* and Shakespeare in one passage speaks of men "debating with the sword"; but the term has now an entirely different meaning. While two speakers or sets of speakers who are formally discussing a question battle with words to prove their points and disprove those of their opponents, they are not disputing or quarreling; they are systematically arguing, and are making an appeal to reason, not to prejudice, sentiment or the emotions. They are *debating.*

Debate differs from the informal and formless discussion of public questions that is often heard around the dinner table or in places where people of leisure congregate, in that it is *organized argument.* The speakers are armed with facts on both sides of the question; they present their points in logical order; they are prepared beforehand to shatter the arguments brought up by the opposite side. The main purpose of a debate is to bring out the truth. A favorable decision won by trickery and not by strength of argument is a hollow victory.

Why Debating Is Beneficial. Participation in debates gives excellent training in self-control. The good debater must school himself to keep his temper and to overcome diffidence before an audience; he must forget himself and keep his mind on the points at issue. Debating trains one to meet emergencies promptly and to think quickly, and this in turn demands preparation. To meet an opponent's arguments a debater must have his knowledge systematized and his facts ready to be presented at a moment's notice. Those who become practiced in debate learn to express their ideas in clear and exact language; their judgment is trained, and their faculty for constructive thinking is developed. Not the least valuable of the results obtained from practice in debating is the ability it gives one to detect false and inconsistent reasoning. The mind schooled to think clearly and logically will not be misled by false arguments and misapplied facts.

What to Debate. Appropriate subjects for debate are to be found in every branch of human knowledge, but not all questions are debatable. A subject for debate must admit both of affirmation and denial; that is, it must not be all one-sided, nor so neutral that no decision can fairly be reached for one side or the other. The following is an example of a one-sided subject: *Resolved, That Shakespeare was a greater poet than Longfellow.* Shakespeare's supremacy is so obvious a fact that the negative side of this question could not well be sustained. Suppose the subject should read, *Resolved, That Shakespeare was a greater poet than Dante.* Here the opposite sides are too evenly balanced, for it is generally admitted that these two poets are practically equal in greatness. A subject should be stated so that the limits of the question will be exactly and clearly defined. If the subject for debate be the restriction of immigration, it should be definitely stated what immigrants are referred to. It is evident that a law which applies to the Chinese, for instance, could not fairly be applied to immigrants from Europe.

Proper Topics for Debate. Any topic for debate may be stated as a fact, as in the examples given above, or as a question. The following list contains subjects drawn from various fields, all of which are suitable:

1. Does the study of mathematics train the mind more effectively than the study of languages?
2. Is fiction more powerful than drama?
3. Is cultural education of more value to the average person than industrial education?
4. Is coeducation in high schools desirable?
5. Is too much emphasis placed on college athletics?
6. Does poverty develop character more than riches?
7. Is the press more influential than the pulpit?
8. Should the moving picture theater be encouraged?
9. Has heredity more influence upon character than environment?
10. Is city life of greater benefit to the individual than country life?
11. Is compulsory arbitration of labor disputes wise and feasible?
12. Are labor unions beneficial to the working classes?
13. Should wages of women be lower than those of men performing the same service in the same occupations?
14. Is the recall of public officials an influence for good in political life?
15. Is state [or provincial] prohibition preferable to local option in dealing with the liquor problem?
16. Should vivisection be prohibited by law?
17. Should women be granted the same political rights as men?
18. Should a nation maintain a large standing army?
19. Is the maintenance of large standing armies and big navies injurious to the advancement of world-wide peace?
20. Was President Wilson justified in refusing to recognize Huerta's government in Mexico?

A debate is always opened by the first speaker for the *affirmative* side, who states the question clearly and then presents his arguments. The first speaker for the *negative,* who follows, seeks to refute the arguments of the previous speaker, and he also advances arguments of his own. He is followed by the second speaker for the affirmative, and so on, until all have presented their points. Finally, the first debater is given a few moments for closing arguments.

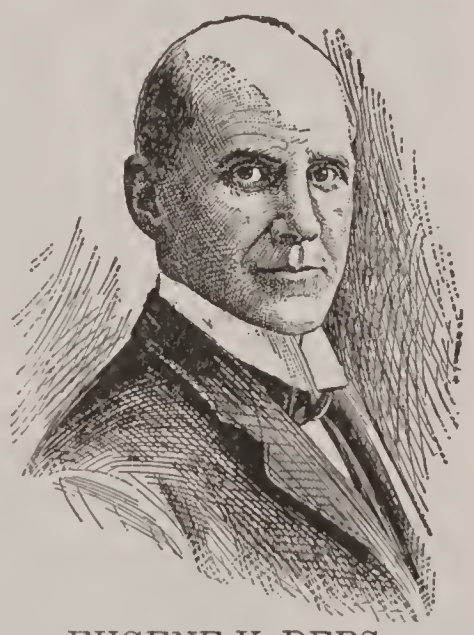
A Debate Outlined. A topic of present-day interest and one which is suitable for school debating societies is here submitted, together with the arguments for the affirmative and negative sides of the question:

Resolved, That the organization and maintenance of labor unions should be encouraged.

AFFIRMATIVE	NEGATIVE
1. Labor unions are favorable to the interest of the working classes and protect them in their rights. Workmen who are not united are at a disadvantage in dealing with employers, for the latter are combined, and they have control of capital and machinery, and therefore of industry. By acting in unison members of labor unions can demand and secure better wages and shorter hours, they can maintain their wages in times of financial depression, and they can use their influence to secure laws that favor labor.	1. Labor unions are detrimental to the members because they place all men on a common level, regardless of ability. Individual advancement is prevented because the output of each member is limited. Individual liberty is restricted because men are forced to join the unions, they are denied the right to work where they wish, and are forced to go on strikes even when it is contrary to their judgment.
2. Labor unions are advantageous to employers. Business relations have been simplified by means of agreements as to hours of labor, wages and conditions of employment. Competent employees may always be obtained by applying to local unions.	2. Labor unions are injurious to the employer. They restrict his rights as an individual by dictating whom he shall employ or discharge. They infringe upon his right to buy material by placing boycotts on products of non-union labor. In times of labor disputes they infringe upon his rights as a property owner.
3. Labor unions promote the welfare of society. Dignified labor conventions have taken the place of disorderly and unorganized meetings of workmen. Foreign laborers through the unions have become Americanized and been made useful members of society. They encourage thrift and economy; their members are insured against death, sickness and unemployment, relieving society of a great burden. The character of the workmen is elevated through the sentiment of mutual assistance and support, and rules against idleness and vice.	3. Labor unions are detrimental to the public welfare because they place their own interests above those of the public by interfering with the operation of street cars, railroads and other public utilities, during strikes. Standards of citizenship are lowered by their disregard of law and order at such times. By ordering sympathetic strikes without just cause they bring about industrial depression and disturbances, and economic loss.
4. Methods adopted by labor unions are justified because, like other organized bodies, they restrict the liberty only so far as it is necessary to bring about the desired end, which in this case is the betterment of labor conditions. They do not arbitrarily fix a uniform wage rate, but a minimum rate, and they leave the question of higher pay for better service open for adjustment by the individual. Unions do not interfere with the rights of non-union men to work when and where they please, but union men are justified in refusing to work with non-union men because: The unions expend a great amount of time, trouble and money to bring about more favorable labor conditions, and it is not fair for non-union men to share benefits without sharing the burdens.	4. Labor unions are wrong in principle because they aim to accomplish a legal object in an illegal manner; that is, by ordering strikes which result in loss of life and destruction of property, by demanding the discharge or non-employment of non-union men, and by violating the fundamental rights of personal liberty. Labor unions are monopolies contrary to public policy and should be condemned.

DEBORAH, *deb'o ra,* a prophetess of Israel during the period of the Judges. Women, in all the world's history, in pointing to others of their sex who have accomplished notable things and have shown themselves capable in public affairs, never fail to mention Deborah. She was known as a "mother in Israel." In a campaign to deliver Israel from the Canaanites, whose yoke had been endured for twenty years, she joined Barak, the leader of the northern tribes of Israel, and together they destroyed the army of the Canaanites in the "plain of Esdraelon on the brook Kishon." The Canaanite leader, Sisera, fled and was murdered in his sleep by Jael, wife of Heber the Kenite. Then "the land had rest for forty years." *Judges* V gives the Song of Deborah, telling of joy over the nation's deliverance, and is considered one of the finest poems in the Old Testament.

DEBS, Eugene Victor (1855-), a leading American Socialist, who has several times been a candidate for President of the United States on the Socialist ticket, and who is known to hundreds of thousands of Americans as an advocate of the rights of laboring men. He was born in Terre Haute, Ind., was educated in the common schools and began life as a locomotive fireman on the Terre Haute & Indianapolis Railroad. He next sold groceries for a wholesale house. From 1879 to 1883 he held office as city clerk of Terre Haute, and in 1885 entered the Indiana legislature. Eight years later Debs organized the American Railway Union, which under his leadership won an important strike on the Great Northern Railway in 1894.



EUGENE V. DEBS

He was also the prime mover in the great tie-up of Western railroads centering in Chicago in 1894, which was broken by the interference of the Federal courts and by the vigorous measures of President Cleveland. In July of that year he was arrested on a charge of violating a Federal injunction in connection with the strike, and was sentenced to six months in jail. While he was serving his term he was visited by a Socialist leader and from that period dates his activity as a member of the Socialist party. He was its Presidential candidate in 1904, 1908 and 1912. In 1919 he was imprisoned on a ten-year sentence for anti-war activities; was released Christmas Day, 1921.

DEBT, *det,* is that which is due; more strictly, it is a sum of money due from one person to another. Originally the law regarded as a debt only those claims based on a definite, expressed agreement. This narrow view has long been abandoned, and a debt is now regarded as "all that is due a man under any form of obligation or promise." A debt, therefore, may be created by a special contract or by an ordinary business transaction.

If the debtor—the person who owes money—is unwilling or unable to pay the debt, the creditor may bring suit to recover his money. This is a *civil suit* (a suit of one citizen against another), and ordinarily results in a *judgment* in favor of the plaintiff, and the debtor usually has to pay the costs of the suit. If the court decides that the defendant does not really owe the alleged debt, the costs must be paid by the plaintiff. If the debtor fails to pay after judgment has been rendered against him, the creditor may appeal to the sheriff for an *execution* of judgment, and may seize enough of the debtor's property to pay the debt and the costs of the process. In all states and provinces some of the debtor's property is exempt from seizure; this exemption ranges from a house and lot owned by the debtor and used as a homestead, to a small amount of personal property, if the debtor be married; the exemption in such case usually is not more than $400 in value.

Statute of Limitations. Ordinarily the courts assert that a debtor should pay his debts even though the creditor does not demand payment. The obligation rests on the debtor. On the other hand, if the creditor makes no effort to collect the money within a certain number of years, the debt is said to be *outlawed* by the *statute of limitations.* If a creditor makes no effort to obtain payment within a reasonable time, the law assumes that there may have been a good reason for not doing so and gives the debtor the benefit of the doubt by relieving him of the debt. The tables on page 1725 show the number of years a debt may run in the United States and Canada before it is outlawed.

Imprisonment for Debt and Other Penalties. The laws regarding debtors have changed greatly with the progress of the ages. In

IN THE UNITED STATES

STATES AND TERRITORIES	STATUTES OF LIMITATIONS			STATES AND TERRITORIES	STATUTES OF LIMITATIONS		
	Judgments, Years	Notes, Years	Open Accounts Years		Judgments, Years	Notes, Years	Open Accounts Years
Alabama	20	6	3	Montana	10	8	5
Alaska	10	6	6	Nebraska	5	5	2
Arkansas	10	5	3	Nevada	6	6	4
Arizona	4	4	3	New Hampshire	20	6	6
California	5	4	4	New Jersey	20	6	6
Colorado	20	6	6	New Mexico	7	6	4
Connecticut	(*g*)	6	6	New York	20 (*f*)	6	6 ▲▲
Delaware	10 (*e*)	6	3	North Carolina	10	3 *	3
District of Columbia	12	3	3	North Dakota	10	6	6
Florida	20	5	3	Ohio	5	15	6
Georgia	7	20	6	Oklahoma	5	5	3
Hawaii	20	6	6	Oregon	10	6	6
Idaho	6	5	4	Pennsylvania	5 (*d*)	6 ‡	6
Illinois	20	10	5	Porto Rico	5	3	3
Indiana	20	10	6	Rhode Island	20	6	6
Iowa	(*c*)	10	5	South Carolina	10	6	6
Kansas	5	5	3	South Dakota	20	6	6
Kentucky	15	15	2	Tennessee	10	6	3
Louisiana	10	5	3	Texas	10	4	2
Maine	20	6	6	Utah	8	6	4
Maryland	12	3	3	Vermont	8	6	6
Massachusetts	6 (*b*)	6	6	Virginia	20	5 *	5
Michigan	6	6	6	Washington	6	6	3
Minnesota	10	6	6	West Virginia	10	10	5
Mississippi	7	6	3	Wisconsin	20 (*a*)	6	6
Missouri	10	10	5	Wyoming	21	10	8

* Under seal, 10 years. ‡ Under seal, 20 years. ▲▲ Six years from last item. (*a*) Justice Court judgments, 6 years. (*b*) Witnessed, 20 years. (*c*) Twenty years from time when new suit may be brought, which is 15 years after first judgment. (*d*) Ceases to be a lien after the period unless revived. (*e*) Subject to renewal. (*f*) Not of record, 6 years. (*g*) No limit.

ancient times the debtor was handed over to the not usually tender mercy of his creditors; in Greece, in Rome, among the Jews and even in England under the Saxons, the debtor became in name and in fact the slave of his creditors. During the Middle Ages the man who was unable to pay his debts received more leniency. Every man was primarily a

IN CANADA (*Years*)

PROVINCE	Judgments	Notes	Open Acc'ts
Alberta	12	6	6
British Columbia	20	6	6
Manitoba	10	6	6
New Brunswick	20	6	6
Nova Scotia	20	6	6
Ontario	20	6	6
Prince Edward Island	20	6	6
Quebec	30	5	5
Saskatchewan	12	6	6
Yukon	12	6	6

soldier, and his services were at the call of his overlord. In such a system it was impossible to allow imprisonment for debt to break up an army. As the feudal system declined and trade and industry became more important, the debtor was again subjected to harsh treatment. The uncertainties of business made it necessary to keep a strong check on debtors, and imprisonment was the usual penalty for delinquent debtors. Imprisonment, however, seldom brought the creditor the money he wanted, and the debtor's prison gradually became recognized as a blot on the penal system.

Imprisonment for debt is still allowed in nearly all countries, including Great Britain, Canada and the United States, but only in such exceptional cases as involve fraud, false pretenses or other statute offenses. For ordinary debtors the terrors of prison are no more. The writings of Charles Dickens had an important part in teaching the English-speaking world the horrors and the uselessness of the debtor's prison. Imprisonment for debt, with a few exceptions, was abolished in France in 1867, in England in 1869, in Belgium in 1871, in Ireland in 1872, in Switzerland in 1874, and in many other countries since then. In the United States such imprisonment has been abolished by the statutes of the individual states. (See BANKRUPTCY, which is a remedy both for debtors and for creditors.)

Debt, National. See NATIONAL DEBT.

DECALOGUE, *dek'a lahg,* the TEN COMMANDMENTS, comprising the whole moral law, which, according to the Old Testament, were "written with the finger of God" on two tables of stone and given to Moses on Mount Sinai. The text and application of all versions are practically the same, but the division varies in

different churches. For example, the Roman Catholic arrangement combines the first and second commandments and divides the tenth into two. The Hebrews called these precepts the "ten words." The Greeks adopted the name, for the Greek *deca* means *ten,* and *logos,* a word.

DECATUR, *de ka' tur,* ILL., named for Commodore Decatur, is the county seat of Macon County, situated in the central part of the state, thirty-eight miles east of Springfield and 173 miles southwest of Chicago. It is on the Sangamon River and on the Wabash, the Illinois Central, the Cincinnati, Hamilton & Dayton and the Vandalia railroads. The Illinois Traction System operates electric service to Springfield, Peoria, Bloomington, Champaign and other cities. In 1910 the population was 31,140; in 1920 it was 43,818. The area is over six square miles.

The city has Fairview, Lincoln, Nelson and Torrence parks, a Carnegie Library, a hospital and a home for the aged and orphans. Decatur is the seat of James Millikin University (Presbyterian), a coeducational school founded in 1901. Excellent railroad accommodations have given Decatur a large trade in the produce of the surrounding agricultural country and coal from mines in the vicinity. The important industrial plants are manufactories of iron products, plumbing supplies, water-works equipment, electric-light fixtures, soda fountains, corn shellers, hominy, corn meal, corn flour and starch.

Decatur was settled in 1830 and was incorporated in 1836. The commission form of government was adopted in 1911. The water works and electric light plant are owned and operated by the city. The organization of the Grand Army of the Republic originated at Decatur with the creation of Post 1 on April 6, 1866.

DECATUR, STEPHEN (1779-1820), one of the most daring officers in the American navy during the early period of United States history. In 1798 he enlisted as midshipman, was promoted to the rank of lieutenant the following year, and in 1803, during the war with Tripoli, took command of the *Enterprise,* which was then a part of the Mediterranean squadron. On the night of February 16, 1804, Decatur took a small vessel, the *Intrepid,* with a picked band of Americans, into the harbor of Tripoli, set fire to the frigate *Philadelphia,* which had been captured by Tripolitan pirates, and under a fierce fire from the enemy's batteries made his way back to the fleet, stationed at Syracuse; not a man was killed and only one was wounded. This act, pronounced by the English Admiral Nelson to be the "most daring of the age," won him a sword of honor and appointment as captain.

STEPHEN DECATUR

Early in the War of 1812, while commanding the *United States,* he captured the British frigate *Macedonian,* after a desperate struggle. In 1813 he was given the honorary title of commodore and placed in command of a squadron in New York harbor. In January, 1815, while attempting to run the British blockade, his flagship, the *President,* struck on the bar at Sandy Hook and became disabled. Decatur, forced into a fight against heavy odds, was finally compelled to strike his colors and was taken a captive to Bermuda.

He was soon paroled, and in the same year took command of the operations against Algiers, Tunis and Tripoli, forcing those countries to respect the rights of other nations on the Mediterranean (see BARBARY STATES). On his return to the United States he was made navy commissioner, and held this office until his death, which occurred in a duel with Commodore James Barron. Particularly famous is Decatur's "toast":

"Our country! In her intercourse with foreign nations may she always be in the right; but, our country, right or wrong."

DECCAN, *dek' an,* a name which is somewhat variously applied to the great peninsula of India. In a general sense it includes the whole of Hindustan south of the Nerbudda River; in another sense it is restricted to the region lying between the Nerbudda and Kistna rivers. The British government considers it as within the larger limits and makes it include the great Madras and Bombay presidencies and several native states. The region is a vast plain, 700 miles long and 800 miles at its greatest width. Two ranges of mountains run along the coasts, known as the Eastern and Western Ghats. The Deccan contains the densest population in the world. See INDIA.

DECEMBER, the twelfth and last month of the year, often represented pictorially by a very old and feeble Father Time, leaning on a staff. The *decem* of its name, so familiar to even the beginning Latin student, seems strange as applied to this month, for it means *ten;* but in the old Roman days, before the reform of the calendar, December was the tenth month. By the time the change was made the numerical significance of its name had been somewhat lost sight of; at any rate, no learned Roman thought it of enough importance to call for correction. One alteration occurred, however; for centuries December had had but twenty-nine days, but Caesar added two, making it one of the longest months. The holly is the special flower of this month, and its gem is the turquoise. See CALENDAR.

December's Place in the Year. The first of December is generally considered to begin the winter season, but in reality winter does not commence until December 22, the day on which the sun reaches the solstice (see SOLSTICE) and turns back for its northward journey. In the northern hemisphere that is the shortest day of the year, in the southern hemisphere, the longest, though for a month thereafter there is little perceptible change in the length of the days. Though December is frequently spoken of as the "frosty month" or the "icy month," it is not usually the coldest of the winter months, nor is it the most cheerless, for the good will, the crackling fires and the holly of approaching Christmas seem to shed a glow over all. The Romans made Vesta, goddess of the hearth, the special deity of December, and this seems appropriate, for there is no time when hearth fires are more in evidence or when they have a greater significance.

The great Christian festival of Christmas (which see), celebrated on the twenty-fifth, is the chief holiday of the month; indeed, to the children at least, it is the chief holiday of the year. The thirty-first, the last day of the year, is known as New Year's Eve, and often partakes of the festivities with which the opening of the new year is celebrated. New England has set apart the twenty-first for special reverence, and calls it Forefathers' Day. On that day the Pilgrims, that "band of exiles," "moored their bark on the wild New England shore" and began to make history that yet influences the entire country.

December Out-of-Doors. This is one of the months in which Nature seems to be resting, for of the manifold activities of summer and autumn there remains scarcely a trace. This does not mean that the month has no interesting out-of-door phases. There are the hardy evergreen trees and the holly—how are they able to live and be so cheerful when the other plants seem practically dead? Why has not the cold driven away the English sparrows and the chickadees, with most of the other birds? There are wonderful "Jack Frost" traceries to be studied on the windows (see FROST), and beautiful snow crystals to be examined under the microscope, and there are all the strange achievements of the cold. Why is not the ice in the brook as rippled as is the water in summer time? Since cold contracts, why does the frozen milk push its way up out of the bottle, and why does freezing water crack a pitcher? The child can do no better than to interest himself in such studies as these in this winter month, for it is even more necessary than in the summer that he should have plenty of out-of-door air, since homes are not likely to be as well ventilated as in the open-door and open-window season. A.MC C.

DECEMBER CALENDAR

Birthdays

3. Gilbert Stuart, 1755
   George B. McClellan, 1826
4. Thomas Carlyle, 1795
5. Martin Van Buren, 1782
   George A. Custer, 1839
6. John S. Mosby, 1833
7. Mary, Queen of Scots, 1542
8. Eli Whitney, 1765
   Henry Timrod, 1829
   Joel Chandler Harris, 1848
9. John Milton, 1608
10. William Lloyd Garrison, 1805
    Edward Eggleston, 1837
12. John Jay, 1745
    John S. Macdonald, 1812
13. Phillips Brooks, 1835
14. Tycho Brahe, 1546
    Sir Francis Hincks, 1807
15. George Romney, 1734
16. Jane Austen, 1775
17. Ludwig von Beethoven, 1770
    Sir Humphry Davy, 1778
    John Greenleaf Whittier, 1807
18. Lyman Abbott, 1835
    Edward A. MacDowell, 1861
19. Gustavus Adolphus, 1594
    Edwin M. Stanton, 1814
20. Cyrus Townsend Brady, 1861
21. Thomas à Becket, 1117
    Benjamin Disraeli, 1804
22. James E. Oglethorpe, 1696
24. Christopher ("Kit") Carson, 1809
25. Sir Isaac Newton, 1642
    Clara Barton, 1821
26. Thomas Gray, 1716
27. Johann Kepler, 1571
    Sir Mackenzie Bowell, 1823
28. Woodrow Wilson, 1856
29. William E. Gladstone, 1809

Events

1. Hudson's Bay Company transferred government rights to the Dominion, 1869
2. Napoleon crowned emperor of France, 1804
   Battle of Austerlitz, 1805
   Monroe Doctrine advanced in President Monroe's message to Congress, 1823
   Austrians occupied Belgrade, 1914
3. Battle of Hohenlinden, 1800
   Illinois admitted to the Union, 1818
5. England established uniform postal rate for letters, 1839
   Rome was made the capital of Italy, 1870
6. Columbus discovered Haiti, which he named Hispaniola, 1492
   Jefferson Davis died, 1888
   German forces captured Bucharest, capital of Rumania, 1916
7. Cicero assassinated, 43 B. C.
8. Americans began siege of Quebec, 1775
   Chinese adopted Roman calendar, 1911
   British won naval victory off Falkland Islands, 1914
9. Confederation formed by Australian colonies, except New Zealand and New South Wales, 1885
10. Mississippi admitted to the Union, 1817
    Sherman's army took Savannah, Georgia, 1864
    Wyoming women authorized to vote and hold office, 1877
11. Indiana admitted to the Union, 1816
12. Fort George, in Canada, abandoned by the United States, 1812
    Sherman's army completed its march to the sea, 1864
    Japanese invaded Korea, 1894
    Delhi made capital of India, 1911
13. Sir Francis Drake left England to sail around the world, 1577
    Federals defeated at Fredericksburg, 1862
14. Alabama admitted to the Union, 1819
15. Hartford Convention assembled, 1814
    Alabama Claims Commission convened at Geneva, Switzerland, 1871
16. Oliver Cromwell declared Lord Protector for life, 1653
    "Boston Tea Party," 1773
17. Milan Decree issued, 1807
18. Russian squadron entered Port Arthur, 1897
    Egypt proclaimed a British protectorate, 1914
20. Texas declared itself independent of Mexico, 1835
21. Pilgrims landed at Plymouth, Massachusetts, 1620
22. Chino-Japanese treaty signed, 1905
24. Methodist Episcopal Church in America organized, 1784
    Treaty of Ghent signed, 1814
25. Washington and his men crossed the Delaware, 1776
26. Battle of Trenton, 1776
28. Spain recognized Mexican independence, 1836
    Iowa admitted to the Union, 1846
    Women given permission to practice in law courts of Canada, 1892
29. Thomas à Becket assassinated, 1170
    Texas admitted to the Union, 1845
    First American Y. M. C. A. established in Boston, 1851
30. Gadsden Purchase arranged, 1853
31. Palmetto flag of South Carolina raised over United States arsenal at Charleston, South Carolina, 1860

For Study

Chickadee
Christmas
Electricity
English Sparrow
Fir
Gas
Holly
Ice
Mistletoe
Nuts
Orange
Pop corn
Squirrel
Winter heavens (see ASTRONOMY)

DECEMBER QUOTATIONS

1. December drops no weak, relenting tear,
   By our fond summer sympathies ensnared,
   Nor from the perfect circle of the year
   Can even winter's crystal gems be spared. *Cranch.*

2. I hold it true with him who sings
   To one clear note in divers tones
   That men may rise on stepping-stones
   Of their dead selves to higher things.
   Tennyson.

3. Politeness has been well defined as benevolence in small things.
   Macaulay.

4. Literature is the thought of thinking souls. *Carlyle.*

5. Blow, blow, thou winter wind,
   Thou are not so unkind
   As man's ingratitude:
   Thy tooth is not so keen,
   Because thou art not seen,
   Although thy breath be rude.
   Shakespeare.

6. Theirs not to reason why,
   Theirs but to do and die. *Tennyson.*

7. The very perfection of manners is not to think about yourself. *Whately.*

8. All work, even cotton-spinning, is noble; work is alone noble. *Carlyle.*

9. Thousands at his bidding speed,
   And post o'er land and ocean without rest;
   They also serve who only stand and wait. *Milton.*

10. Our country is the world; our countrymen are mankind. *Garrison.*

11. The stars are glittering in the frosty sky,
    Numerous as pebbles on a broad seacoast. *Heavysege.*

12. Nature does well whatever task she tries
    Because *obedient*—there the secret lies.
    Smith.

13. Good manners is the art of making those people easy with whom we converse. *Swift.*

14. The sweeping blast, the sky o'ercast,
    The joyless winter day,
    Let others fear; to me more dear
    Than all the pride of May. *Burns.*

15. Obedience is better than sacrifice, and to hearken than the fat of rams.
    Psalms.

16. Politeness is to do and say
    The kindest thing in the kindest way.

17. I know not where his islands lift
    Their fronded palms in air;
    I only know I cannot drift
    Beyond his love and care.
    Whittier.

18. When another speaks be attentive yourself and disturb not the audience. *Washington.*

19. A moral, sensible and well-bred man
    Will not affront me, and no other can.
    Cowper.

20. The soldier who executes his captain's commands is no less valuable than the captain who gives the order.
    Cervantes.

21. Wild was the sky; the wintry sea
    Moaned sadly on New England's strand,
    When first the thoughtful and the free,
    Our fathers, trod the desert land.
    Bryant.

22. Ay, call it holy ground,
    The soil where first they trod;
    They left unstained what there they found—
    Freedom to worship God. *Hemans.*

23. Obedience alone gives the right to command. *Emerson.*

24. But peaceful was the night
    Wherein the Prince of light
    His reign of peace upon the earth began. *Milton.*

25. I heard the bells on Christmas Day
    Their old, familiar carols play,
    And wild and sweet
    The words repeat
    Of peace on earth, good-will to men.
    Longfellow.

26. The boast of heraldry, the pomp of power,
    And all that beauty, all that wealth e'er gave,
    Await alike the inevitable hour—
    The paths of glory lead but to the grave. *Gray.*

27. Heap on more wood! — the wind is chill;
    But let it whistle as it will,
    We'll keep our Christmas merry still.
    Scott.

28. Let thy child's first lesson be obedience, and the second will be what thou wilt. *Franklin.*

29. To the cold December heaven
    Came the pale moon and the stars,
    As the yellow sun was sinking
    Behind the purple bars. *Shanly.*

30. Cap in hand never harmed anyone.
    Italian Proverb.

31. Good-bye, kind year; we walk no more together,
    But here in quiet happiness we part;
    And from thy wreath of faded fern and heather,
    I take some sprays, and wear them on my heart. *Doudney.*

DECEMVIRS, *de sem' verz,* a term which might be applied to any official body of ten men (from *decem,* meaning *ten*), but having specific reference to the ten magistrates appointed in 451 B. C., with absolute powers for one year, to systematize the laws of Rome. The first commission governed with wisdom and moderation, but its successors were extremely unpopular, their violence and despotism leading to an insurrection and the abolishment of the office in 449 B. C.

DECIDUOUS, TREES, those trees which lose and renew all their leaves each year at definite seasons, as the oak, ash, beech, birch, elm and many others which are familiar to everyone. The term *deciduous* is from Latin words which mean *something which falls down.* In temperate countries most deciduous trees lose their leaves in the autumn, or fall of the year, leaving twigs and branches bare in winter; in the spring they don a new garb of green. In certain other countries the falling of the leaves is governed by times of drought, etc.

The falling of the leaves is caused by the formation of a waterproof layer of tissue where the leaf joins the twig, as a result of which the leaf is cut off from its source of supply. It then has a weaker hold on the twig and the winds loosen it. See LEAVES.

Those trees which have a covering of leaves all the year are called evergreens (see EVERGREEN).

DECIMAL FRACTIONS. Our system of writing numbers is a decimal system. (For a full discussion of this, see NOTATION.) Since a clear understanding of our decimal notation is essential to an intelligent attack upon decimal fractions, a short review of it is given here.

Place value is the idea underlying the system of notation. The number expressed by $\overset{abc}{222}$ is 200+20+2. The value of *b* is 10 times as great as that of *c;* the value of *a* is 10 times as great as that of *b*. A digit represents so many *ones,* or so many *tens,* or so many *hundreds,* and so on, according to the column, or "place," it occupies. Read the lettered digits, giving their full number values: $\overset{ab}{7886}$; *a* reads 800; *b* reads 80. *b* is ⅒ as large as *a*. In the expression $\overset{abc}{6444}$ *a* reads 400; *b* reads 40; *c* reads 4; *c* is ⅒ as great as *b; b* is ⅒ as great as *a*.

Much of this reading should precede the study of decimal fractions, and there should also be work such as the following: Read the underlined, giving full value: $\underline{7}836$; $\underline{92}48$; $\underline{4}924$; $\underline{7}3926$. They read 800, 30; $\bar{9}000$, $\bar{4}0$; $\bar{4}00\bar{0}$, 4; $\bar{3}000$, 20.

Read, giving full value to each part, and write as you read, indicating this full value: 7936=7000+900+30+6. Write in column form:

$$\begin{array}{r} 7000 \\ 900 \\ 30 \\ 6 \\ \hline 7936 \end{array}$$

It took the human race about twelve centuries to take the step from writing *whole numbers* in a decimal system to writing *fractions* in the same system. The decimal fraction appeared in the sixteenth century, and it was not until the eighteenth that it was recognized in the schools. The nineteenth century brought it into somewhat general use, but the early twentieth century sees it supplanting generally the common fraction in the scientific and industrial world.

Let us examine the method of transition from the decimal notation applied to whole numbers, to the same applied to fractions. In the expression $\overset{abc}{111}$, *c* is ⅒ of *b; b* is ⅒ of *a*. It is desired to write a number which is ⅒ of *c*. Place 1 to the right of *c* and have *1111;* by this transaction the original number *111* is changed to *1111;* that is, *c* has changed from 1 to 10, and *b* from 10 to 100 and *a* from 100 to 1000. But we wish to write a number that is ⅒ of *c,* and not change the value of the original number *111*. How can it be done? In other words, how can we write $111\frac{1}{10}$, using the decimal system employed in writing whole numbers? Here are several of the ways used in the sixteenth and seventeenth centuries:

$$111|\underline{1};\ 1111;\ \overset{01}{1111};\ 111\ \bar{1};\ 111\ \underset{01}{1};$$

and there were other methods. Below are given some illustrations of decimals, whole and fractional, as they appeared in the early days of decimal fractions:

$$7186|\underline{847};\ 7186\ \overset{123}{847};\ 7186\overline{847};\ 7186^{0}8^{1}4^{2}7^{3};$$

each reads seven thousand one hundred eighty-six and eight hundred forty-seven thousandths, although the early writers read the fractions at first 8-tenths, 4-hundredths, 7-thousandths.

This short historical review shows that the great difficulty of the men who first tried to write decimal fractions was to find a means of

distinguishing, or *separating,* the fraction from the whole number. Some sign of separation was needed. These more or less clumsy ways of designating that separation have given way to the comma and decimal point. Indeed, the decimal point was used by one writer in 1612, but was abandoned. The comma is used to-day in many countries of Europe. The United States uses the point. (Mathematicians are interested at present in having the countries agree on one separatrix, America, of course, hoping that the point will be adopted.) With the simple separatrix, the writing of decimal fractions becomes an easy matter. The beginner in decimal fractions writes 1.1, one and 1-tenth; 1.11, one, 1-tenth and 1-hundredth; 16.123, 16 and 1-tenth, 2-hundredths and 3-thousandths. The decimal fractions should be read to him and by him for some time in this way. He is asked to write 4 and 7-tenths and 8-hundredths, and he writes 4.78 and reads it as above; then he is asked to write 4 and 8-hundredths, and, finding he must fill the tenth's place with zero, he writes 4.08, and reads 4 and 8-hundredths. Gradually he reduces the fraction and reads 4 and 78-hundredths (see Fig. 1).

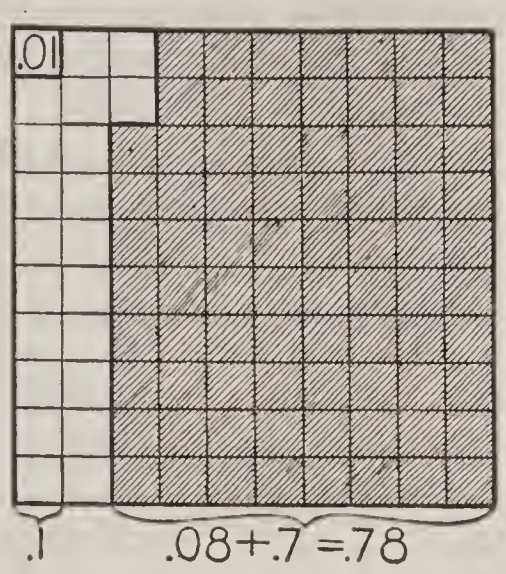


FIG. 1

The shaded portion represents 78 units, each of which has the value .01; or, 7 units having the value .1, plus 8 having the value .01.

The necessity of this reduction is evident; .78 is 7-tenths and 8-hundredths, which reduced to hundredths gives 78-hundredths. Approaching it from the other side, 78-hundredths, reduced, gives 7-tenths and 8-hundredths.

Which is hundredth's place?
The second place.
Which is thousandth's place?
The third place.

These are the kinds of questions that should come to the beginner in decimal fractions; not "How many places for hundredths? for thousandths?" and so on.

After the reduction, the decimal fraction is read just as a common fraction; the number to the right of the decimal point is the numerator, and is read as a whole number, and the denominator is recognized from the last place occupied by the numerator; for example, .75 is read 75-hundredths, .094 is read 94-thousandths, 12.1854 is read 12 and 1854-ten-thousandths. These written as common fractions would appear:

$$\frac{75}{100},\ \frac{94}{1000},\ 12\frac{1854}{10000}$$

Reduction of Decimal Fractions. If .6 is to be considered in hundredths, the hundredth's place is filled with a zero and the fraction appears .60. If it is to be considered as thousandths, both hundredth's and thousandth's places are filled with zeros, and the fraction .700=.70=.7.

$$\begin{array}{l} .600 \\ .6=.60=.600 \end{array}$$

Six-tenths=sixty-hundredths=600-thousandths.

Other illustrations:

$$.75=.750 \qquad .500=.50=.5$$
$$\frac{75}{100}=\frac{750}{1000} \qquad \frac{500}{1000}=\frac{50}{100}=\frac{5}{10}$$

From this we see that (1) zeros annexed to a decimal fraction do not change its value, as .7=.70=.700, and (2) zeros may be dropped from the end of a decimal fraction and the value of the fraction remain the same, as, .700=.70=.7.

Addition and subtraction of decimal fractions hold nothing new for the child if he has appreciated the place value idea set forth above. He adds or subtracts just as in whole numbers; no time need be given to these. He sees that he needs the decimal point in the *answer* between units and tenths just as in the addends or above the line. He knows that "the points must come under each other" so that tenths are all in the same "place," or column, hundredths all in the same place, etc. So, without preliminaries he adds or subtracts as follows, just as in whole numbers:

$$\begin{array}{r} 7.8 \\ 16.48 \\ \underline{12.096} \\ 36.376 \end{array} \qquad \begin{array}{r} 14.693 \\ \underline{-\ 8.452} \\ 6.241 \end{array}$$

$$124-16.943=n$$
$$\begin{array}{r} 124.000 \\ \underline{-\ 16.943} \\ 107.057 \end{array}$$

$$\begin{array}{rr} 7.8 & 7.800 \\ 4.586= & 4.586 \\ 19.81 & \underline{19.810} \\ & 32.196 \end{array}$$

The numbers to be added or subtracted may be reduced to the same denomination as in the last two problems above, by filling the places with zeros.

After the child has worked a day or two

with the decimal fractions he begins to wonder what to do when he has halves, fifths and so forth. If one can work only with tenths, hundredths and so on, he thinks the scheme of not much general value. Here is the time for introducing reduction of common fractions to decimals. He readily knows

$$\tfrac{1}{2}=.5;\ \tfrac{1}{5}=.2;\ \tfrac{4}{5}=.8;\ \tfrac{3}{4}=.75$$

and so on (see Fig. 2), but how can he reduce a fraction when he does not know what decimal is its equivalent? Let us investigate.

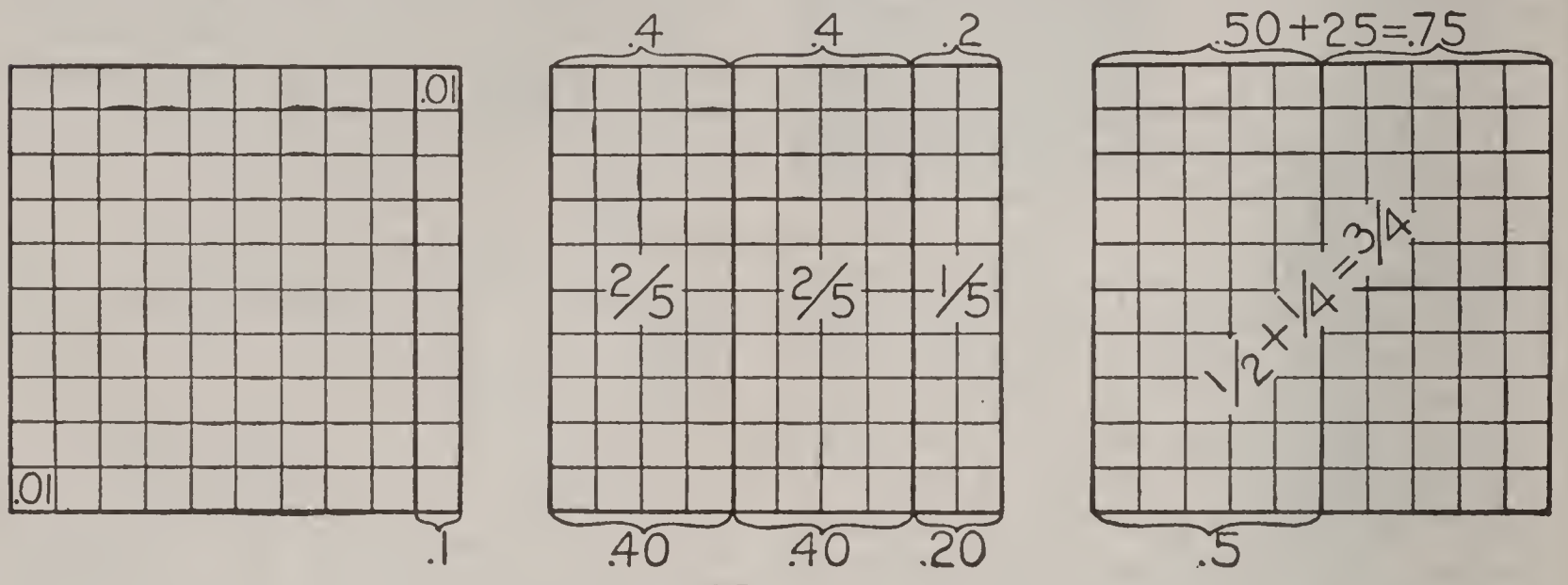


FIG. 2

1 = 1.0. (Read, 1 equals ten-tenths, and write it as shown). 1 = 1.0.

$\frac{1}{2}=\frac{1.0}{2}=.5$. Read, $\frac{1}{2}$ equals $\frac{1}{2}$ of ten-tenths, or .5.

$\frac{1}{5}=\frac{1.0}{5}=.2$. Read, $\frac{1}{5}$ equals $\frac{1}{5}$ of ten-tenths, or .2.

$\frac{2}{5}=2\times\frac{1.0}{5}=\frac{2.0}{5}=.4$. Read, $\frac{2}{5}$ equals $2\times\frac{1}{5}$ of ten-tenths, or $\frac{1}{5}$ of 20-tenths, or .4.

$\frac{3}{5}=\frac{3.0}{5}$. Read, $\frac{3}{5}=\frac{1}{5}$ of 30-tenths.

He sees that to reduce a common fraction to tenths he changes the numerator to tenths and divides by the denominator:

$\frac{1}{8}=\frac{1.0}{8}=.1\frac{1}{4}$
(Fig. 3)

$\frac{1}{8}=\frac{1\,00}{8}=.12\frac{1}{2}$

$\frac{1}{8}=\frac{1.000}{8}=.125$

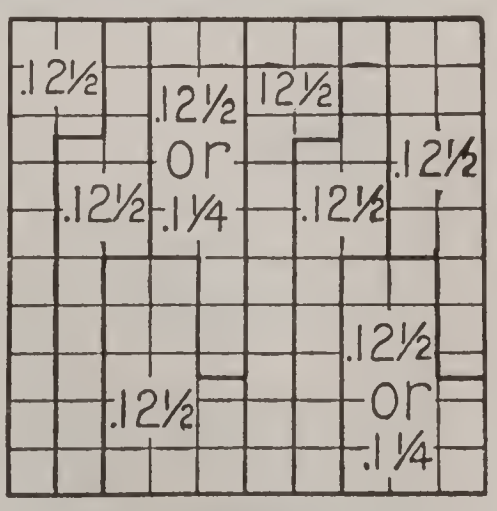


FIG. 3

Read ⅛ equals ⅛ of ten-tenths, or .1¼. This is not a desirable form, because there is still a common fraction; he changes it to hundredths and finds still a common fraction; he tries thousandths and finds the form rid of a common fraction, so he has $\frac{1}{8}=\frac{1.000}{8}=.125$, reading ⅛=⅛ of one-thousand-thousandths, or 125-thousandths. Therefore,

$$\tfrac{3}{8}=3\times\tfrac{1.000}{8}=\tfrac{3.000}{8}=.375$$

(Fig. 4). Now he is ready to change any common fraction to a decimal fraction. He changes the numerator to tenths, hundredths, etc., and divides by the denominator. He sees that his answer must be the same decimal name as his numerator (or dividend).

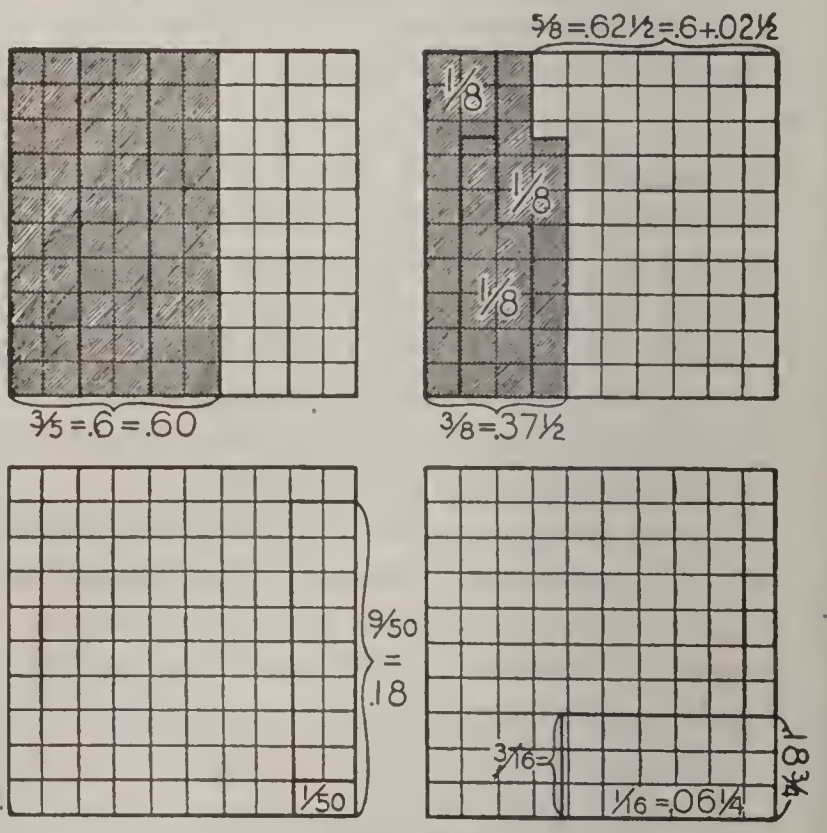


FIG. 4

Put into rule form, it becomes: To change a common fraction to a decimal fraction, change the numerator to tenths, hundredths, etc.; divide by the denominator, and point off as many places in the answer as there are in the numerator; for example:

$$\frac{7}{8}=\frac{7.000}{8}=.875$$

$$\frac{3}{16}=\frac{3.0000}{16}=.1875$$

$$\frac{9}{50}=\frac{9.00}{50}=.18$$
$$\frac{17}{80}=\frac{17.0000}{80}=.2125$$
$$\frac{2}{3}=\frac{2.0000}{3}=.6666+$$

Then follows the common fraction that cannot reduce to a decimal fraction without having a fraction in the numerator of the decimal:

$$\frac{1}{3}=\frac{1.0}{3}=.3\frac{1}{3}$$
$$\frac{5}{6}=\frac{5.00}{6}=.83\frac{1}{3}$$
$$\frac{5}{6}=\frac{5.0000}{6}=.8333\frac{1}{3}$$

There are two points of interest here:

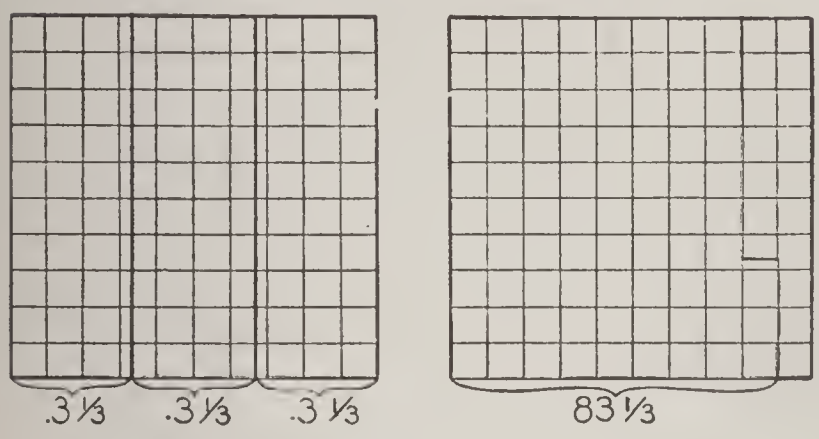


FIG. 5

(1) In $.3\frac{1}{3}$, $\frac{1}{3}$ is $\frac{1}{3}$ of a tenth (Fig. 5)

In $.83\frac{1}{3}$, $\frac{1}{3}$ is $\frac{1}{3}$ of a hundredth

In $.8333\frac{1}{3}$, $\frac{1}{3}$ is $\frac{1}{3}$ of a ten-thousandth

(2) When shall one drop the fraction? This depends upon the real problem that gives rise to the fraction, and *only the conditions of that problem can determine when the fraction may be discarded.* This depends upon the value of the material and the degree of accuracy desired. Is it a fraction of a pound of coal or of a gram of radium? Is the answer required a rough estimate or a refined exactness? But for practice in abstract numbers the class may carry to two places at one time, three places another time, and so on. These points determine when the fraction may be dropped.

Multiplication of Decimals. Moving the decimal point changes the place of the digits that express a number, and therefore changes the value of the number; for example, 67.3. Here 6 represents 60, 7 is 7 ones, 3 is 3-tenths. Move the point one place to the right, 673.; 6 becomes 600, 7 becomes 70 and 3 becomes 3 ones, making the number 10 times what it was before. Move the point one place to the left, and have 6.73; 6 becomes 6 ones, 7 becomes 7-tenths and 3 becomes 3-hundredths, which makes the number ⅒ what it was at first. So we see that moving the decimal point one place to the right multiplies the number by 10, and moving it one place to the left divides the number by 10.

Multiply the following by moving the point one place to the right, and we have:

7.6	76.
4.16	41.6
17.09	170.9
6.004	60.04

Divide the following by 10 by moving the point one place to the left, and we have:

8.6	.86
12.07	1.207
.18	.018

It is easily seen from the above discussion that moving the point two places to the right multiplies, and two places to the left divides, the number by 100. This can be seen for any number of places when the effect of moving one place is clear.

Multiplier changes:

(1) $424\times142=60208$
(2) $424\times14.2=n$

How does the second multiplier compare with the first? It is ⅒ as great; therefore the second product is ⅒ as great as the first. We find a number ⅒ as great as 60208 by moving the decimal point one place to the left. So (2) above becomes $424\times14.2=6020.8$.

(3) $424\times1.42=n$

How does the third multiplier compare with the second? It is ⅒ as great; therefore the third product will be ⅒ as great as the second product. This number we get by moving the point in the second product one place to the left, and we have $424\times1.42=602.08$. Now let us look at the three together:

$$424\times142=60208$$
$$424\times14.2=6020.8$$
$$424\times1.42=602.08$$

We see that when the *multiplicands are the same* and the *multiplier changes,* the *product changes in the same proportion as the multiplier.*

The same thing can be shown where the multipliers are the same and the multiplicand changes, as:

$$424\times142=60208$$
$$42.4\times142=6020.8$$
$$4.24\times142=602.08$$

The second product is ⅒ of the first, and the third is ⅒ of the second, because in each case the multiplicand is ⅒ as great as the preceding one and the multiplier is the same as the preceding multiplier. Here the product changes as the multiplicand changes.

Multiplicand and multiplier change:

$424 \times 142 = 60208$
$424 \times 14.2 = 6020.8$
$42.4 \times 14.2 = 602.08$
$42.4 \times 1.42 = 60.208$
$4.24 \times 1.42 = 6.0208$

From this it is seen that the product varies in value as the multiplicand and multiplier together vary, that for each division of either multiplicand and multiplier by 10 the product is divided by 10; put in the common language of arithmetic, "The product contains as many decimal places as the multiplicand and the multiplier together." (See Fig. 6.)

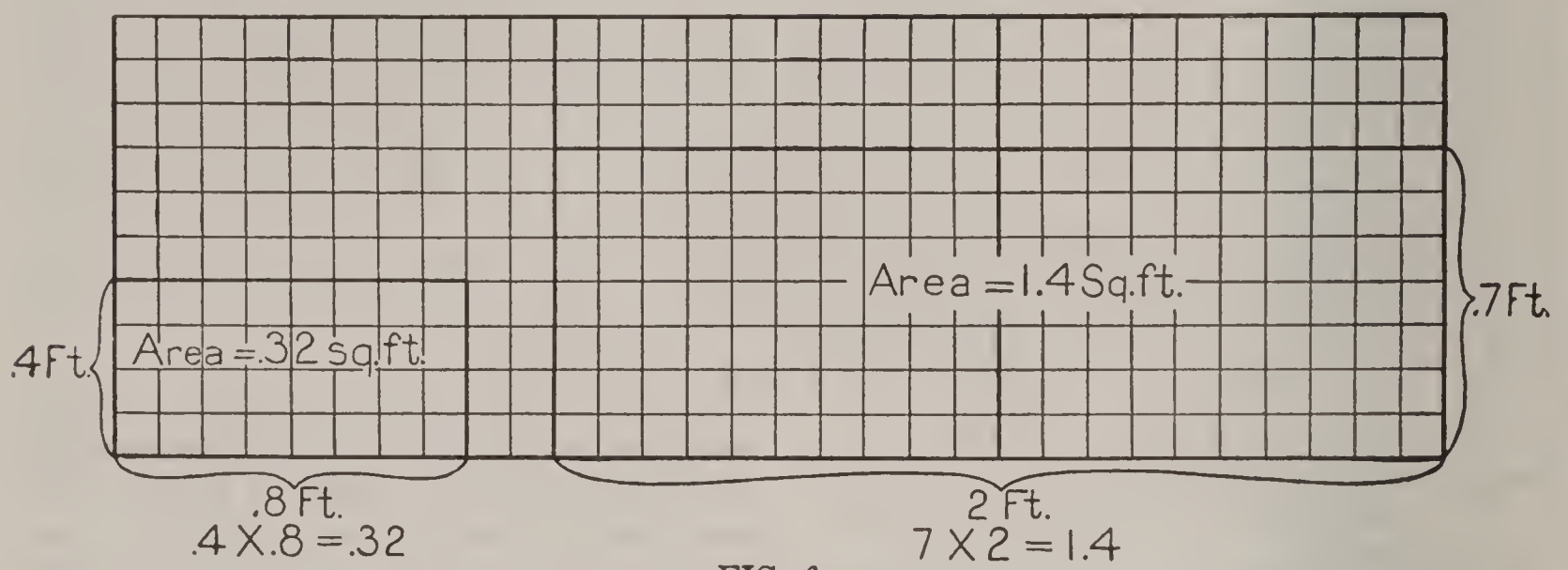


FIG. 6

The formal rule is: *Multiply as in whole numbers; point off in the product as many decimal places as there are decimal places in the multiplicand and the multiplier.*

Division of Decimals. This follows directly from multiplication; with two points clear in mind division of decimals presents no new difficulty. These points are:

(1) A dividend is the product of the divisor and quotient.

(2) A product contains as many decimal places as the multiplicand and multiplier together contain. That is, (1) $7 \times 8 = 56$, and (2) $7 \times n = 5.6$.

Number (2) above says, "What number multiplied by 7 gives the product 5.6?" From the work we have done in multiplication of decimals we know that the missing number must have one decimal place because the product has one; now the other term, 7, has none, and therefore $n = .8$. In this statement (3), $7 \times n = .56$, the product has two decimal places, and the given number, 7, has none; so n must have two, and $n = .08$.

In (4), $.7 \times n = .056$, the product has three decimal places and the given number, .7, has one decimal place; therefore n must have two decimal places and $n = .08$.

If (5) $n \times .08 = .0056$, $n = .07$. Why? Because the number of decimal places in n added to the number in .08 makes 4, the number in .0056, the product.

Express the same problems in division:

(2) $5.6 \div 7 = n$ (n stands for the quotient)
(3) $.56 \div 7 = n$
(4) $.056 \div .7 = n$
(5) $.0056 \div .07 = n$

One sees how many decimal places there are in n each time by seeing what number of decimal places must be added to the number of decimal places in the divisor to make the number of decimal places in the dividend (or, in other words, he sees the *dividend* as a *product*). This attack upon division of decimals makes it a very simple piece of work. The dividend is a product; therefore, it contains as many decimal places as the two terms, namely, divisor and quotient, that produce it. Expressed as a rule:

Divide as in whole numbers, and point off as many decimal places in the quotient as added to the number of decimal places in the divisor will give the number of decimal places in the dividend.

One special case must be considered under this that often gives much trouble; namely, where the dividend does not have so many decimal places as the divisor. Since the dividend is the product of divisor and quotient, it must have at least as many places as one of those terms. For example, put into multiplication form, $15 \div .75 = n$; $15 = .75 \times n$. When .75 and n were used to give a product, that product must have had at least two decimal places; therefore 15 in its present form could not have come from such multiplication; it must have been 15.00 or have had more decimal zeros. The division problem now is:

$15.00 \div .75 = n$ Proof: .75
$n = 20$ 20
15.00

SIGNING OF THE DECLARATION OF INDEPENDENCE

From the painting by Trumbull

The proof shows clearly that 15.00, and not 15, was the form of the product; and that form must be restored so that we may divide.

Let us look at it first from the view of multiplication, and then division:

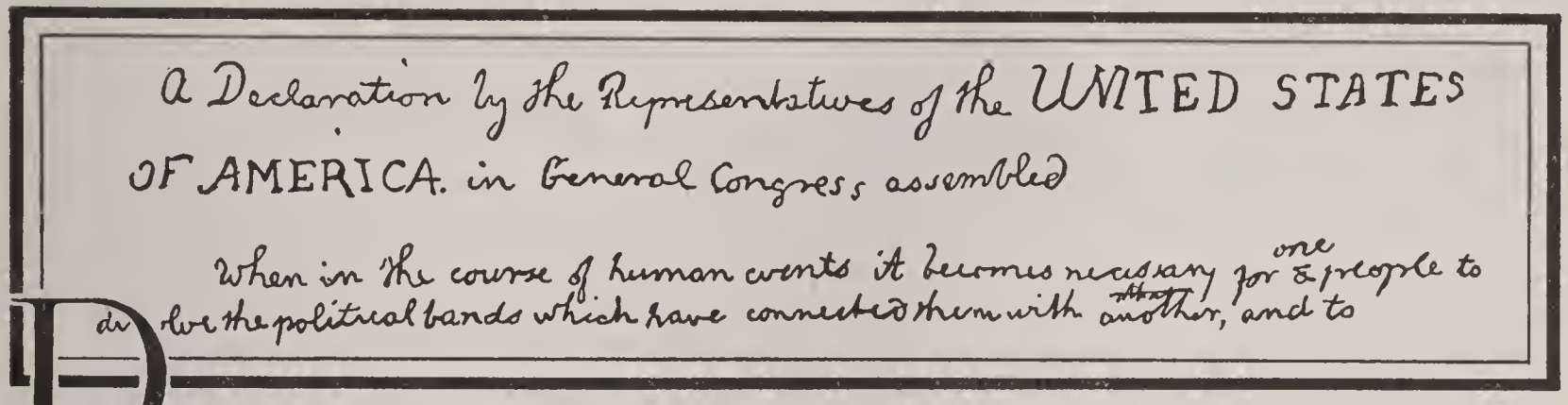
$$\begin{array}{r} 144 \\ .25 \\ \hline 720 \\ 288 \\ \hline 36.00 \end{array} \qquad 36 \div .25 = n$$

Restore the two zeros that we discarded, and we have $36.00 \div .25 = 144$.

To sum up: When a product ends in decimal zeros, these zeros may be cut off, but when this product is brought to view again as a dividend, the discarded zeros must be restored before division is performed. In the language of arithmetic: *The dividend must have at least as many decimal places as the divisor before we begin to divide, and if it has not, we must add the required number of decimal zeros.* For example:

$$\begin{array}{r} 18 \div .006 = 18.000 \div .006 = 3000 \\ 1.8 \div .006 = 1.800 \div .006 = 300 \\ .18 \div .006 = .180 \div .006 = 30 \\ 225 \div .15 = 225.00 \div .15 = 1500. \\ 7000 \div 1.4 = 7000.0 \div 1.4 = 5000 \end{array}$$

A.H.



DECLARA'TION OF INDEPEND'ENCE, a famous historic document, which, adopted by the Continental Congress on July 4, 1776, proclaimed to the world the independence of the thirteen colonies of Great Britain in America, and marked the birth of a new nation. When this Declaration was passed, actual warfare to drive out the forces of the mother country had already begun. The battles of Lexington and Concord and of Bunker Hill had been fought, Ticonderoga and Crown Point had been wrested from the British, Washington had been appointed commander-in-chief of the army, and the last futile petition had been sent to King George III. The spirit of independence was abroad.

Lee's Memorable Resolution. Early in 1776, several delegates to Congress, which was in session in Philadelphia, were instructed by the patriots whom they represented to vote for a formal statement of independence, and Massachusetts, New Hampshire and South Carolina had previously set up independent colonial governments. On May 15 Congress adopted a resolution advising all the other colonies to follow the example of the three, and the way was therefore paved for the famous resolution of Richard Henry Lee of Virginia, who moved on June 7:

That these United Colonies are, and of right ought to be, free and independent States; that they are absolved from all allegiance to the British Crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved;

That it is expedient forthwith to take the most effectual measures for forming foreign alliances;

That a plan of confederation be prepared and transmitted to the respective colonies for their consideration and approbation.

These motions were at once seconded by John Adams of Massachusetts, and were debated on June 8 and 10, but action thereon was postponed until all the colonies could act.

The Committee on Declaration. On June 10 a committee was appointed "to prepare a Declaration to the effect of the first said resolution." On this committee were some of the most illustrious men of the period—Thomas Jefferson, its chairman, and his four able assistants, John Adams, Benjamin Franklin, Roger Sherman and Robert R. Livingston. The committee made its report on June 28.

The Final Steps. On July 1 the consideration of Lee's resolution was renewed, Congress forming itself into a committee of the whole and sitting with closed doors while the great debate was in progress. John Adams delivered a speech in favor of the resolution which was so effective that Thomas Jefferson afterward called him the "Colossus of that debate." The next day Lee's motion was formally adopted,

The illustration with the heading of this article is a *facsimile* of the first lines of the original Declaration, as written by Thomas Jefferson.

on July 3 the Declaration, which was drafted by Jefferson, was taken up, and on July 4 it was passed and published to the people. The delegates from twelve colonies gave their approval at this time, New York adding its vote on July 9. In its final form the Declaration is shorter than reported by the committee, as several amendments were made before the final vote was taken.

WHERE THE DECLARATION WAS WRITTEN

House in Philadelphia in which Jefferson and his associates framed the document.

The news of the adoption of the Declaration of Independence brought rejoicing to all parts of the country, and the famous Liberty Bell in Independence Hall was rung as never before, for Fourth of July of 1776 gave new meaning to the legend engraved upon it—"Proclaim liberty to all the land and to the inhabitants thereof" (see LIBERTY BELL). The original document since 1921 is in the care of the Library of Congress, sealed in a steel case to protect it from light and air, and preserved with the nation's other priceless relics.

DECLENSION, *de klen'shun.* When the different forms of any noun or pronoun are arranged in their order in the three cases and both numbers, we are said to *decline* it, or to give its *declension.* Thus, declension is to nouns and pronouns what conjugation is to verbs and comparison to adjectives; that is to say, it is a form of inflection, or the systematic arrangement of changes in form. The noun *man,* the personal pronoun *he,* and the relative pronoun *who* are declined above as types.

	SINGULAR	PLURAL
Nom.	man	men
Poss.	man's	men's
Obj.	man	men

SINGULAR	PLURAL	SINGULAR AND PLURAL
he	they	who
his	their	whose
him	them	whom

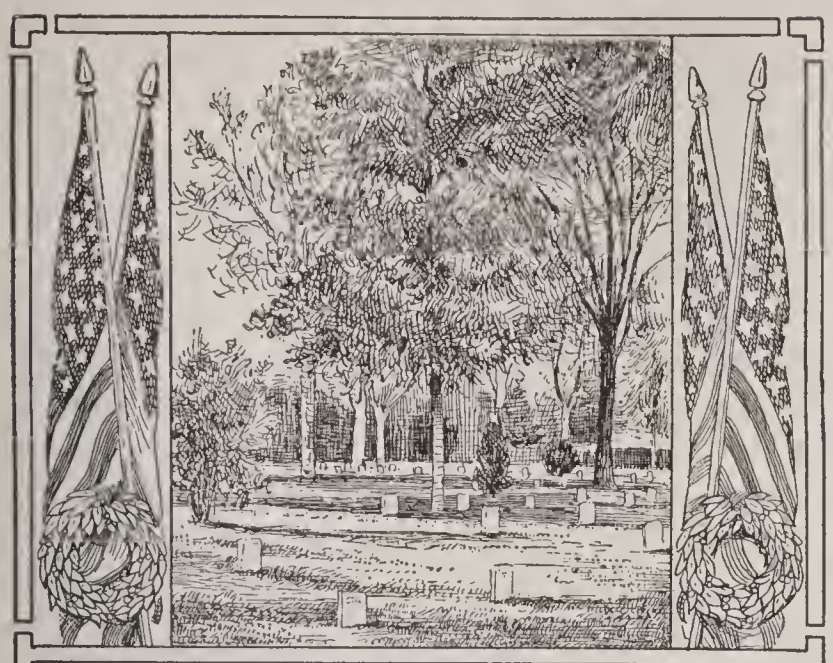
Among the interrogative and relative pronouns, *who* (with its compounds *whoever* and *whosoever*) is the only one that is declined, for *which, what* and *that* have the same form in both the nominative and objective cases, singular and plural, and are not used in the possessive case.

DECLINATION, *dek li na'shun.* See ASCENSION AND DECLINATION OF STARS.

DECOMPOSITION, *de kom po zish'un,* in chemistry, is the process of separating compound substances into the substances of which they are composed—in other words, the process of converting one substance into two or more substances. Thus, water may be decomposed into hydrogen and oxygen, and limestone may be decomposed into lime and carbon dioxide. The term *decomposition* is most commonly applied to the separation of compounds due to natural causes, such as the decomposition of dead vegetable and animal matter under the action of micro-organisms. Such decomposition, or *decay,* is aided by moderate heat and by moisture (see BACTERIA; MOLDS).

Dry substances will not decompose, and a low temperature retards or stops decomposition. Heating for a time to the temperature of boiling water will kill the micro-organisms and so preserve the vegetable or animal matter. These methods are all used in the preserving of foods. Poisonous substances from decaying food often injure the system and sometimes produce fatal results (see PTOMAINE). Decaying food, of course, should not be eaten, though some people like the flavors that develop in meat that has begun to decay. Game is sometimes left hanging until it has acquired such flavors. It is then said to be "high." The flavors of some sorts of cheese are also developed by the organisms concerned in decay; these are called *putrefactive organisms.* J.F.S.

DECORA'TION DAY, or **MEMO'RIAL DAY,** one day in the spring of each year set apart as a legal holiday in most of the states of the American Union, to do honor to those who fought on either side in the War of Secession. Out of an expression of love and grief by bereaved women of the South—the strewing of wild flowers on the graves of their soldier dead one certain day each year—has grown a nation-wide and beautiful custom. Since 1899 the celebration of the day has been extended



Decoration Day

SUGGESTIVE PROGRAMS

1.

One flag, one land, one heart, one hand,
One nation evermore! *Holmes*

Song, *Battle Hymn of the Republic*
Flag Salute
For Decoration Day.....Rupert Hughes
Over Their Graves.....H. J. Stockard
Ode for Decoration Day (Extract)....
.....*Peterson*
We'll Honor the Graves..A. S. Sherwood
Song, *Columbia the Gem of the Ocean*
May 30, 1893.....J. K. Bangs
"A Prophecy," from *Lincoln's Grave...*
..... *Maurice Thompson*
The Soldier's Grave.....E. P. Nicholson
The Ship of State.....Longfellow
Memorial Day.....H. H. Jackson
Song, *America*

2.

No more shall the war cry sever,
Or the winding rivers be red;
They banish our anger forever
When they laurel the graves of our dead!

Song, *The Star-Spangled Banner*
Essay, *The Meaning of the Day*
The Blue and the Gray.....F. M. Finch
Conquered at Last.....M. L. Eve
Decoration .....Higginson
The American Flag.....Drake
Song, *Cover Them Over with Beautiful Flowers*
Salute to Our Flag.....B. E. Burke
Scatter Your Flowers....M. N. Robinson
A Georgia Volunteer....M. A. Townsend
Ode for Decoration Day.....Timrod
The Palmetto and the Pine.....French
Song, *Hail Columbia*

to include the honored dead of the Spanish-American War.

General John A. Logan, commander-in-chief of the Grand Army of the Republic, in 1868 designated the thirtieth day of May as the day on which the graves of dead Union soldiers should be decorated, and this date is now universally observed throughout the Northern states. April 26 is appointed as Memorial Day in Alabama, Florida, Georgia and Mississippi; in North and South Carolina the day set apart is May 10; the second Friday in May is observed in Tennessee; and in Louisiana, Jefferson Davis's birthday, June 3, is also that state's Memorial Day. Decoration Day is now a day of dignified addresses, exercises, parades and military salutes, as well as strewing of flowers and planting of shrubs.

DECOY, *de koi'*. Hunters of wild ducks and geese have a number of methods of inducing their prey to come within gunshot by attracting them to other birds, either captive or artificial, called decoys. Sometimes a ring is fast-

A LIVING DUCK AND A CANVAS DECOY

ened around the leg of a captive duck, and a weight is hung from the ring by a few feet of rope. When, with two or three others held in a like manner, the duck is placed in the water, it flutters about within a narrow range and chatters loudly, and passing flocks fly down to see what is the matter. With geese a similar end is gained by placing captives with clipped wings in a large enclosure, around which they can walk but over the walls of which they are unable to fly. Artificial birds may be of wood, shaped and painted, or of air-tight canvas which takes the proper form when inflated.

In England the name decoy is also given to traps into which wild ducks are lured in search of food. A very natural mistake is often made by some people in calling these contrivances *duck-coys*.

DEDHAM, Mass., a town of Norfolk County, of which it is the county seat, ten miles southwest of Boston. Dedham includes three villages and is a residential suburb of Boston. It is on the Charles River and on the New York, New Haven & Hartford Railroad, and has electric interurban service. The population, which in 1910 was 9,284, was 10,783 in 1920, according to the Federal census. The area of the town is nine square miles. Dedham has a fine courthouse, public library, Historical Society building, and a jail and house of correction. The chief industrial establishments are manufactories of woolen goods, machinery and pottery. The town, one of the oldest in the state, was settled in 1636 and named Contentment, and was incorporated under its present name the following year. In 1645 the first public school in America supported by a tax of the people was established there.

DEDUCTIVE, *de duk' tiv,* **METHOD,** a method of teaching in which definitions, principles and rules are stated, and then applied to the solution of a problem or in the classification of facts before the pupil. The teacher who requires her pupils to learn the rules in arithmetic and then use these rules in the solution of the problems assigned in their daily lessons is teaching by the deductive method. The teacher who requires her pupils to learn the definitions in geography and then to apply these definitions to the forms of land and water is also using the deductive method.

The deductive method is often called the method of authority, since it requires the pupil to accept the knowledge gained by another. It is also the method of applying knowledge. When the pupil is old enough to reason, and has arrived at that maturity of judgment which will enable him to determine what rules, definitions or principles to apply to the problem in hand, the deductive method has many advantages. It enables the pupil to apply the knowledge he has already acquired and in this way to fix it firmly in mind; it also saves time. The use of the deductive method increases as the pupils advance in the grades, and most of the text-books designed for grammar grades are based upon the deductive plan, especially those in mathematics, geography and history.

The four successive steps necessary to the success of the deductive method follow:

1. A clear understanding of the problem to be solved.
2. Examination of the principles, definitions and rules or the knowledge possessed by the pupil.
3. Application of the related knowledge to the problem.
4. Testing this application to determine whether or not the correct solution has been reached. See Inductive Method.

DEED, in law, a written contract or agreement, and the evidence of its execution. When the term is used without special qualification it means a written contract for conveying real estate—land and buildings—either by sale or gift. Deeds are of two sorts; *quitclaim* and *warranty.* The quitclaim deed conveys to the purchaser the rights held by the party who sells, and no others; in other words, the seller disposes of his rights in the property, but does not guarantee the purchaser against claims of others. Should the seller's title be faulty, the purchaser under a quitclaim deed cannot recover damages from the seller unless he can prove fraud on the part of the latter.

In a warranty deed the party who sells the property agrees to defend the title against all claims that may be brought against it; in other words, the seller guarantees, or warrants, that the property he transfers is handed over with a perfect title. Should the title unexpectedly prove defective, the purchaser may recover the money paid, with interest, provided the one who sold the property has sufficient means to pay the claim; otherwise the purchaser must stand the loss.

A deed must always be in writing, and must be signed by both parties to the contract, and sealed. Two witnesses are usually required, and the deed should be acknowledged before a notary public or some other official authorized to administer oaths. *Acknowledgment* consists in the seller's declaration under oath that it is his own full act.

When the purchaser receives the deed he should have it *recorded* in the proper office; in most instances this is the office of the registrar of deeds for the county in which the property is located. Every deed should be accompanied by an *abstract of title,* which is a record of all transfers of the property from the original owner (the state) to the present purchaser. The validity of the title depends upon the validity of this abstract.

Torrens System. In the Torrens system, described in this work, under that title, the warranty deed is replaced by a simple transfer, which is given to the registrar together with the duplicate certificate of title in order that a new certificate may be issued.

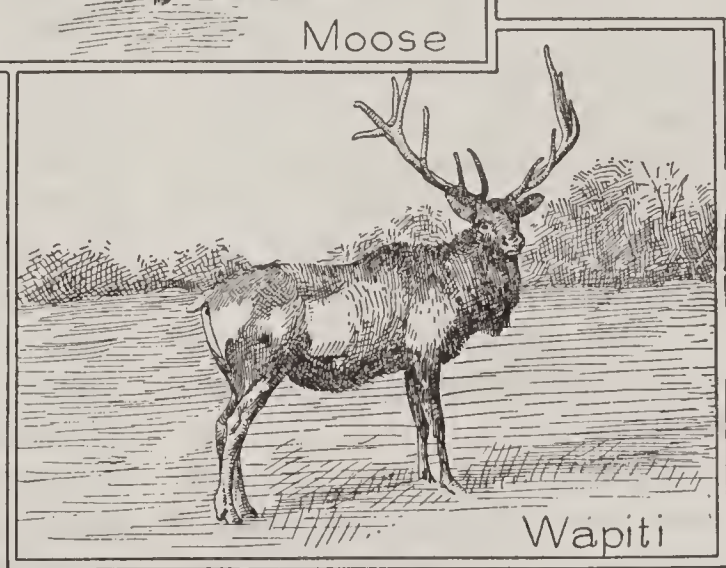
DEEP-SEA FISHERIES. See Fish, subtitle *Deep-Sea Fisheries.*

Mule Deer

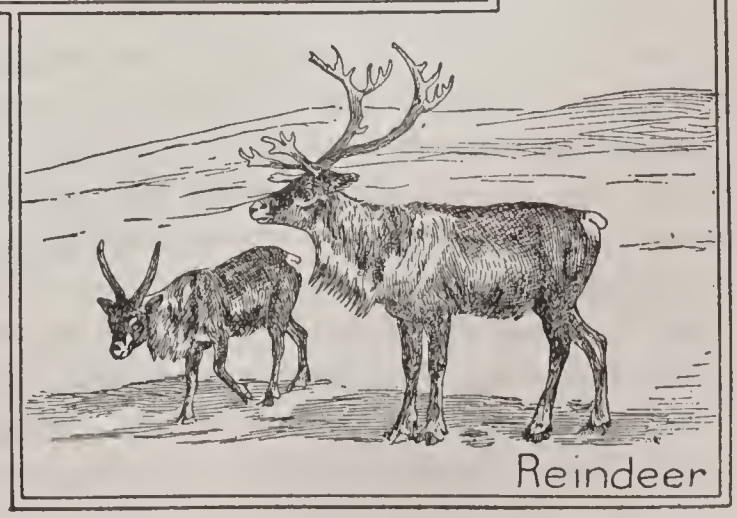
Axis Hind

Fallow Deer

Moose


Wapiti

Female Siberian Roe


Reindeer

DEER, a family of forest-loving, fleet-footed and antlered (horned) animals, slender of limb and with brown eyes large and questioning. To the deer belong the elk, a noble game animal; the reindeer, puller of Northern sledges; the caribou, the moose and the wapiti, each of which is described in these volumes under its individual title. Deer are widely distributed over the world, though there are none in Australia and few in Africa, the antelope corresponding to the deer in the latter continent.

Distinguishing Characteristics. All male deer, also called *stags, bucks* or *harts,* have solid, branching horns, or antlers, which they shed each year. Excepting reindeer, female deer, known as *hinds* or *does,* do not bear antlers, nor do the young, which are known as *fawns.* Antlers are outgrowths from bone and are at first very sensitive, being covered with flesh and velvety skin. When the antlers are fully developed, the skin dries and is removed by rubbing against trees, leaving bare bones. These are valued by man as trophies of the hunt, for umbrella handles, and sometimes for knife handles. Some antlers spread into broad palms which send out sharp snags around their outer edges. Others divide fantastically into branches, some of which project over the forehead, while others are reared upward. From the number of branches the animal's age can be told.

These gentle animals are cud-chewing creatures; they live on leaves, herbs and lily pads in summer, and on lichens, moss and bark in winter, the stags eating only fungi in breeding time. Most deer feed at night; the elk, however, roams about for its food during the morning and afternoon. Each season deer don a new coat of short, brittle hair, the color of which varies with the colors of nature of that time of year. In most deer the senses of hearing, sight and smell are very keen.

Hinds usually bear one fawn early in the summer, although there are occasionally two or three. The fawns stay with the mother two or three years, after which they wander off to mate, although it is said they are not full grown for fourteen or fifteen years. In the United States and Canada the stately mule deer of Rocky Mountain regions, the Columbia black-tail deer of dense Pacific coast forests and the white tail deer are prominent.

It seems almost unbelievable that any human being could shoot one of these animals, when, a picture of peace and innocence, it stands drinking at some rippling mountain stream at sunset time, or when startled bounds gracefully through the woodlands, a beautiful, frightened thing. Hunting deer has been a favorite sport in America, as in Europe, from frontier times, and it became necessary, eventually, to make laws to prevent the extinction of this species. If such laws were not made and enforced, soon *venison,* the meat of the deer, and leggings and gloves of *buckskin,* made from their hides, would be but things of the past, to be read about only in Indian tales, and in such books as Cooper's *Leatherstocking Tales;* and the beautiful animal itself would peer at us only through the netting of some park fence or perhaps only from the canvas of a Landseer. See GAME, subhead *Game Laws.* M.S.

Consult Roosevelt's *Deer Family; Deer Farming in the United States* (Farmers' Bulletin 330, Department of Agriculture).

DEER MOUSE, a name commonly applied in North America to a small, gnawing animal closely allied to the mice and jerboas of Europe, Asia and Africa. It is usually about four inches long, colored reddish yellow on the back and white underneath. The *jumping mouse,* or deer mouse of Canada, is found in considerable numbers in the districts immediately south of Hudson Bay. It is a strong, active creature, with long hind legs and very short forelegs which it uses as paws, like a squirrel. Its long hind legs and tail give it extraordinary jumping powers, a leap of ten feet being easily accomplished. It has a pouch in each cheek in which it carries grain and seeds, to be stored in underground chambers for winter food. The store of food is never touched until it is impossible to obtain any more above ground.

DEFOE, or **DE FOE,** *de fo',* DANIEL (1660-1731), an author of imperishable fame, beloved by boys and girls because he wrote *Robinson Crusoe.* This was one of the first examples of English prose fiction, and it still ranks among the greatest adventure stories in all literature. Defoe was the son of a butcher and was educated for the ministry, which, however, he abandoned, because it was not to his liking. Entering into business, he became a hosier and for a time prospered, but eventually he failed and was declared bankrupt. Friends helped him to make a fresh start, and his second venture proved profitable. He early turned his attention to politics and writing; his first publications were satires that brought him into trouble with the government and eventually led to his imprisonment. He strongly supported William of Orange, and his poem *The True Born Englishman,* defending the king, brought him prompt recognition.

DANIEL DEFOE

In 1719 he published *Robinson Crusoe. The Memoirs of a Cavalier, Captain Singleton, Roxana* and *Journal of the Plague Year* followed, and established his reputation among the greatest writers of his time. Defoe possessed in a remarkable degree the power of presenting fiction as though it were fact. His descriptions of impossible situations are so natural that they appear not only possible but probable. He was a very prolific writer, issuing pamphlets on such varying subjects as religion, politics, commerce, banking and the education of women. His views on these subjects were decidedly modern, and it might be said of him that he was "born before his time." See ROBINSON CRUSOE.

DEGENERATION, *de jen er a'shun,* a word which means *growing worse,* or, to state it scientifically, *falling away from the genus.* Degeneration has special meanings according to the particular science in which it is used.

In Medicine. In medicine degeneration is applied to those changes in tissues and organs which prevent them from performing their functions normally. There are various sorts of degeneration, to each of which physicians have given a Latin name. Degeneration may be caused by old age, by lack of sufficient nourishment, by inactivity, by poisons and by infectious diseases. The liver and kidneys, among the organs, and the mucous membrane, among the tissues, are the most liable to degeneration. Fatty degeneration consists in the accumulation of fat in or around the heart, arteries, liver and other organs. Albuminous degeneration, or cloudy swelling, consists in fine granulation of cells in certain organs, particularly the kidneys and brain.

In Plants and Animals. Degeneration in plants and animals is due to several causes, chief among which are lack of nourishment, unsuitable location and breeding for special purposes.

The first and second causes may be illustrated by plants growing year after year in a poor soil or in an unsuitable climate, or both. The plants will be smaller than those from which the seed was taken. If the seed from these smaller plants is planted season after season an inferior plant, from which no better stock can be obtained, is the final result. This is equally true of animals. The wild horses formerly found in large numbers on the Great Plains in North America and still found in South America are far inferior to the stock from which they sprang.

The second cause is breeding (which see). To illustrate, the development of the double rose was accomplished at the expense of the power of the rose to reproduce itself from its seed. The development of the dairy cow is at the expense of the animal's beef-producing qualities, and the development of the draft horse is at the expense of speed. Degeneration of this sort is not injurious as a whole. The breeder secures the perfection of certain qualities for a given purpose, for which he is willing to sacrifice the other qualities.

Mental and Moral Degeneration. Careful study of crime and delinquency shows beyond question a close relation between physical and intellectual and moral degeneration. By far the larger number of boys and girls brought before juvenile courts are in some respects physically as well as mentally defective. The offspring of defectives are also likely to be defective; hence degeneracy tends to produce degeneracy. There are, of course, exceptions to this rule, since now and then a member of a family in excellent standing is a degenerate. Again, degeneracy may be the result of bad habits which have been followed so long that the victim is unable to regain his former mental and moral state. Alcohol is a potent cause of physical, mental and moral degeneration. See HABIT.

Mental and moral degeneration may apply to a community as well as to an individual. Under slavery entire peoples, as, for example, some of the tribes of Central Africa, have been reduced to a condition little above that of the lower animals. In these cases the degeneration is not entirely confined to the enslaved people; the master is said to be affected as well as the servant. "He who is served is limited in his independence," and no one sustains the relation of master to these almost savage African slaves without themselves being adversely affected.

Living under unhealthful conditions, such as those which the people of the crowded tenement districts in large cities are compelled to endure, is another fruitful source of society degeneration, and certain occupations, especially those connected with the distribution of intoxicating liquors and those which require no intellectual effort, produce a similar effect.

Principles. Certain principles underlie all forms of degeneration. They are:

1. A function or an organ is weakened and finally killed by lack of use. A good illustration is the vermiform appendix in the human body, which is believed once to have been a useful organ, aiding digestion, but which is now not only useless but in some cases dangerous (see VERMIFORM APPENDIX).

2. A persistent course in degeneration in time leads to a state from which it is impossible to return to the former condition. This is equally true of plants and of animals. A draft horse cannot be developed out of a wild pony, neither can a larger variety of corn be produced from the small corn grown in the northernmost part of the corn-growing regions.

3. In man, physical degeneration lies at the foundation of most of his intellectual and moral degeneration. See CRIMINOLOGY. W.F.R.

DEGREE, IN MATHEMATICS. Because the circumference of every circle is 3.14159+ times its diameter, it is necessary in any case to know only one of these dimensions in order to learn the other (see CIRCLE). Therefore to compute the length of an arc of a circle of known diameter, we need only be told how large a part the arc is of the whole circumference. This is one reason why it has been found convenient to say that the circumference of a circle is made up of 360 equal parts called *degrees,* and to subdivide each degree into 60 *minutes* and each minute into 60 *seconds.* There are many other advantages of this division of a circle. Because of it, angles may be measured, thus making possible the science of trigonometry, without which engineers could not survey or mariners steer with accuracy. It also gives a means of describing the exact location of points on the earth's surface. More about the degree will be found in the articles ANGLE; CIRCLE; LATITUDE; LONGITUDE; MERIDIAN.

Measurements in degrees are indicated by symbols, as in 40° 42′ 16″, which means 40 degrees, 42 minutes, 16 seconds.

In Education. One who has completed a course of instruction in an institution of learning is usually granted a title called a degree. In general, these academic degrees indicate how long and what their holders have studied, but the significance of each title varies widely between countries and between schools in the same country. Some degrees, like Doctor of Laws, are often given by universities in honor of success in other lines than learning. The most common degrees will be found listed in the article ABBREVIATIONS, in Volume I.

DE GROOT, *de grote',* HUGO. See GROTIUS, HUGO.

DE KALB, ILL., a city in De Kalb County, in the north-central part of the state, the seat of the Northern Illinois State Normal and Training School. It is fifty-eight miles west of Chicago and seventy miles east of Clinton, Ia., and is on the Chicago & North Western and the Chicago & Great Western railroads and an electric railway. The city has an area of two square miles. It was settled about 1838 and bore the name of Buena Vista until 1840. In 1861 it was incorporated and in 1877 was granted a city charter. The population, largely American, but containing also Swedish, Lithuanians, Finnish and English, in 1910 was 8,102; in 1920 it was 7,871.

The building of the State Normal School was completed in 1897 at a cost of $245,000. The Training School building, added in 1907-1908, cost $74,000, and the dormitory, built in 1914-1915, cost $114,000. Besides two small parks, the city maintains two public playgrounds. De Kalb is called the *Barb City,* referring to barbed wire, the chief manufactured product. The important industrial plants include wire-drawing and woven-wire mills, agricultural implement works, and manufactories of pianos, shoes, gloves, mittens, nails and creamery-packages. An engagement of the Black Hawk War took place at De Kalb, and after the battle a conference was held there by Lincoln, Jefferson Davis and Zachary Taylor. G.N.B.

DE KALB, JOHANN, Baron (1721-1780), a German-American soldier who won distinction in the Revolutionary War. He was born at Hüttendorf, in Bavaria. His name was simply JOHANN KALB, the "Baron" being self-styled. In 1743 he entered the French army and was promoted rapidly, becoming brigadier-general in 1761. In 1777 De Kalb came to America with Lafayette and during the same year was appointed a major-general by Congress. He served with credit in the armies of Washington in Pennsylvania and New Jersey, was second in command under General Gates in the Carolinas and led the American forces at Camden. In the latter engagement he was wounded eleven times, which resulted in his death a few days later. In 1825 Lafayette laid the corner-stone of a monument to De Kalb at Camden, and in Annapolis, in 1887, a statue of him was dedicated.

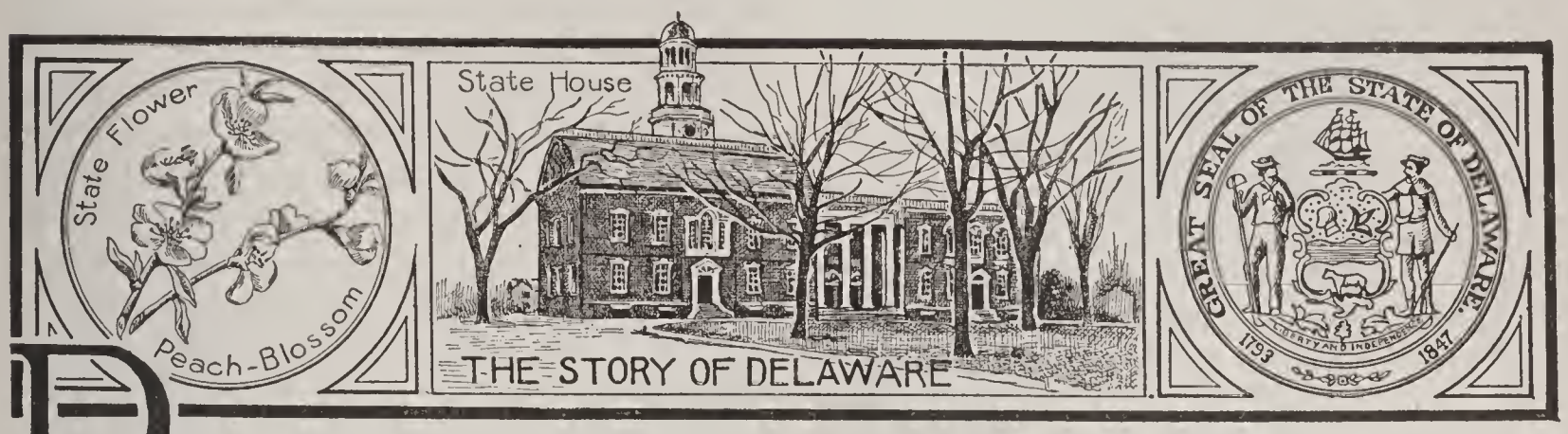
BARON DE KALB

DE KO'VEN, REGINALD (1861-1920), a leading American composer, whose melodious and picturesque opera, *Robin Hood,* produced in 1890, was the first work by an American composer to take rank among standard light operas. He has also composed numerous attractive songs, his *O Promise Me* being a universal favorite. De Koven was born in Middletown, Conn., and was graduated at Saint John's College, Oxford University, England. He studied music in Stuttgart, Florence, Paris and Vienna. His successful opera, *The Begum,* produced in 1887, was the first of a notable list that includes, besides *Robin Hood, The Algerian, Rob Roy, The Mandarin, Red Feather* and many others, all of which are characterized by refinement of melody, richness of harmony and skill in construction. *Margery Daw, A Winter Lullaby, Indian Love Song* and *Ask What Thou Wilt* are among his best songs. De Koven has acted as music critic for several New York publications, and was the founder of the Washington Symphony Orchestra. His opera *Rip Van Winkle* was produced two weeks before he died.

DELAGO'A BAY, an inlet of the Indian Ocean indenting the coast of Portuguese East Africa. The southern portion of the bay is protected from the rolling waters of the ocean by the Inyack peninsula and island. At the head of the bay stands Lourenço Marques, an important port with excellent harborage. The bay has been well dredged and vessels of the largest size can lie alongside the docks. Since the opening of a railway in 1895 from Lourenço Marques to Pretoria, capital of the Transvaal, the commercial importance of Delagoa

Bay has greatly increased. The gold and other products now find a ready outlet to the sea, and the longer freightage to Durban or Cape Town is avoided.

Since the South African War the progress of British South Africa generally has been so rapid that the Portuguese authorities, who control the shipping to and from Delagoa Bay, have been compelled to take steps to meet the demands of traffic. The result has been beneficial to the Transvaal, and especially so to Lourenço Marques, or Delagoa Bay; the latter term is now commonly applied to both port and bay.



DELAWARE, The Blue Hen State, one of the Middle Atlantic states, formerly known far and wide for its production of peaches, which suggested the peach blossom as the state flower. It is one of the original thirteen states of the American Union. Although almost twice as large as Rhode Island, it is the second smallest state in the Union. Texas would make 112 states the size of Delaware. Within its area of 2,370 square miles live 223,003 people, according to the census of 1920, an average of 94 to the square mile. This is one-thirteenth the population of Texas. It is only twice as great as the population of some wards in great cities. The state was named after Lord de la Warr, who entered the bay east of the state in 1611.

It is said that the nickname, *Blue Hen State,* was given to Delaware during the Revolutionary War. A Delaware officer was heard to say that no cock was game unless it came from a blue hen, and thereafter Delaware soldiers were called *The Blue Hen's Chickens.*

Position and Physical Features. Its northern semi-circular boundary divides Delaware from Pennsylvania. This strange boundary was drawn on a twelve-mile radius from the courthouse of the city of New Castle. On the east are the Delaware River, Delaware Bay and the Atlantic Ocean. The straight southern boundary of thirty-six miles, and the ninety-mile straight western boundary, meeting the southern at right angles, separate Delaware from Maryland. From the south, the state tapers gradually to its narrowest region near the north, where it is only nine miles across.

The northern portion of Delaware is a beautiful, fertile region of hills and dales. The highest elevation of the state is 327 feet, at Southwood, near the northern border. Continuing southward, the land surface is uniformly low, level and generally sandy. In the extreme south is an area of swamp land, twelve miles long and six miles wide. That region is covered with cypress and evergreen forests and is known as Cypress Swamp.

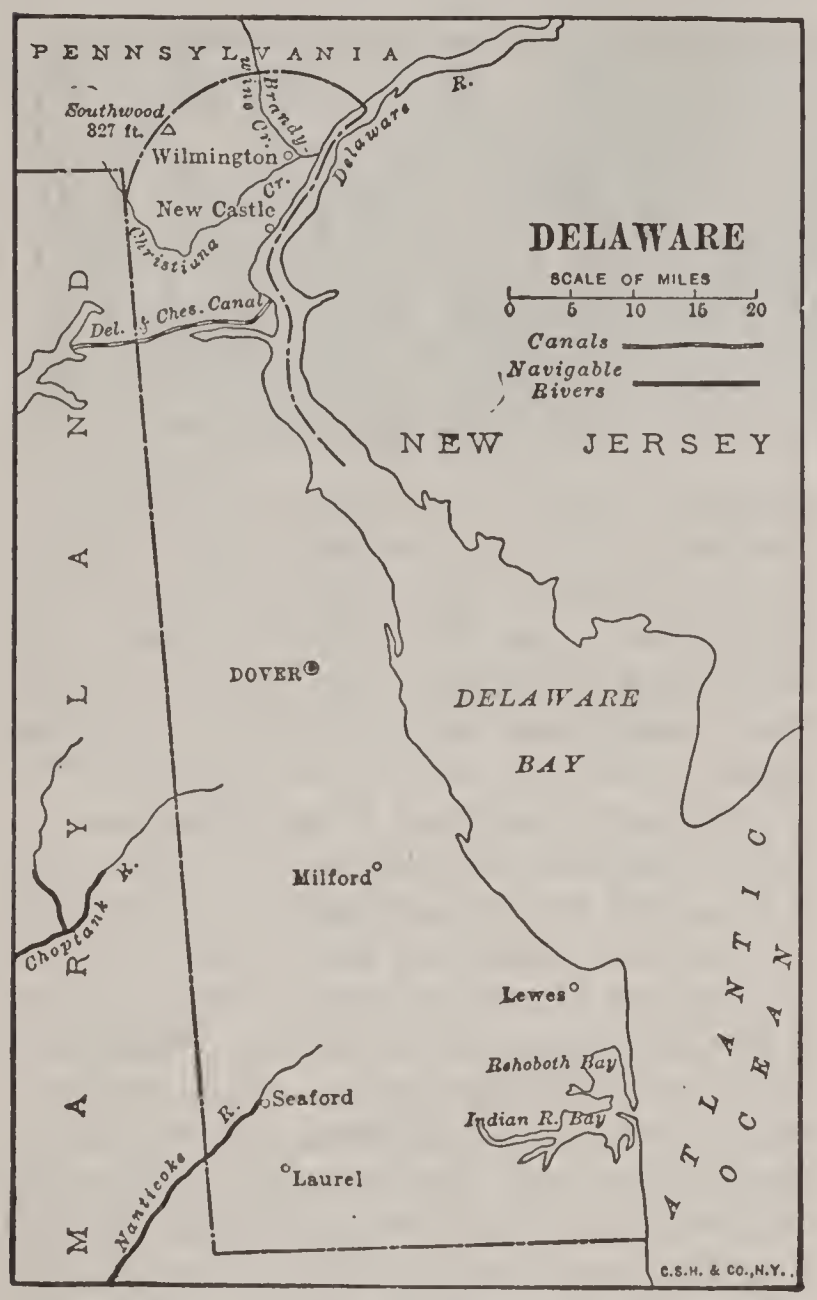
Through the state from north to south runs a long, low divide separating the numerous small streams, which flow east to Delaware Bay and west to Chesapeake Bay. Most of Delaware's streams are not navigable. Vessels go as far as Wilmington up the mouth of Christiana Creek, and as highways to the interior for smaller craft the streams Brandywine, Christiania, Duck, Murderkill, Jones, Mispillion, Indian and Nanticoke are most notable.

The marshy shores along Delaware Bay offer few good harbors, the best ones being at Lewes, near the south, and at New Castle and Wilmington at the north. The construction of the Delaware Breakwater, a remarkable feat of engineering which cost over $2,000,000 and forty years of work, has insured an especially safe harbor at Lewes. Many sand beaches enclose shallow lagoons on the Atlantic coast; none of those waters is useful, however, excepting Rehoboth and Indian River bays, whose common outlet, the Indian River Inlet, permits navigation by small vessels. The Delaware and Chesapeake Canal, thirteen and one-half miles long, from Delaware City to Chesapeake City, Md., affords passage for barges and small steamers.

Climate. Excepting in the southern part of the state, where the swamps breed fever, the climate of Delaware is mild and healthful.

Autumn is particularly pleasant, and frosts seldom occur until about the middle of October, but they may occur in spring as late as the end of April. The average yearly temperature is 55°.

There is ample rainfall to insure good crops, and although occasional droughts cause dam-



OUTLINE MAP OF DELAWARE

Showing boundaries, principal streams and canal, chief cities and location of the greatest elevation in the state.

age, rainfall is usually quite evenly distributed throughout the year. The average rainfall is from forty to forty-five inches.

Agriculture. The soils of Delaware are well adapted to agriculture, and eighty-five per cent of the land is under cultivation. The value of Delaware crops each year is about $10,000,000. The state is well known as a market garden and orchard, especially for the cities of New York, Philadelphia and Baltimore. The leading crops are corn, wheat, hay and forage, which are produced in the rolling country at the north. Apples, potatoes, sweet potatoes and yams also produce a considerable yield. Over one-half the total value of crops of the state is contributed by cereals, one-fifth by potatoes and other vegetables, and about one-eighth by hay and forage.

Although when the state of Delaware is mentioned the peach crop is first in mind, apples are now the most important orchard fruit, and pears sometimes rank next in value. After peaches, fruits of less importance are grapes, cherries and quinces. Every year large quantities of cantaloupes, over 350 carloads of watermelons, about 15,000,000 quarts of strawberries and smaller quantities of other berries reach the great markets from Central and Southern Delaware. In market gardening, the tomato is the principal crop, thousands of acres being devoted to that vegetable alone.

Domestic animals, poultry and bees kept on Delaware farms are worth about $7,000,000. Dairying interests are increasing, and the milk, cream, butter and cheese sold or made each year are valued at over $1,000,000.

Most of the natural woods of the state have been cut away, excepting the cypresses and evergreens of the southern swamps, yet the forest products on farms alone average nearly $350,000 yearly.

Minerals. The mineral resources of Delaware are not extensive, yielding usually less than $500,000 a year. This amount is represented by the output of its stone quarries, and by its clay, sand, gravel and mineral waters.

Manufactures and Industries. Manufacturing is the chief industry of the state, the yearly output of manufactured goods being valued at about $55,000,000, an average of over $180,000 worth each working day. The most important industries are those relating to leather, foundry and machine-shop products, paper and wood pulp, canning and preserving, building of cars for steam railroads, shipbuilding, iron and steel, flour and grist and lumber and timber products. Most of these industries are confined to the city of Wilmington, over forty-five per cent of the population of the state being centered in that section. The canning and preserving industries, however, are conducted outside of Wilmington.

It is interesting to note that the first iron sailing vessel of America was built at Wilmington in 1854; that in Wilmington are located some of the largest "morocco" leather plants in the world; that near Wilmington are located the great Du Pont powder works, the oldest and largest of their kind in the United States.

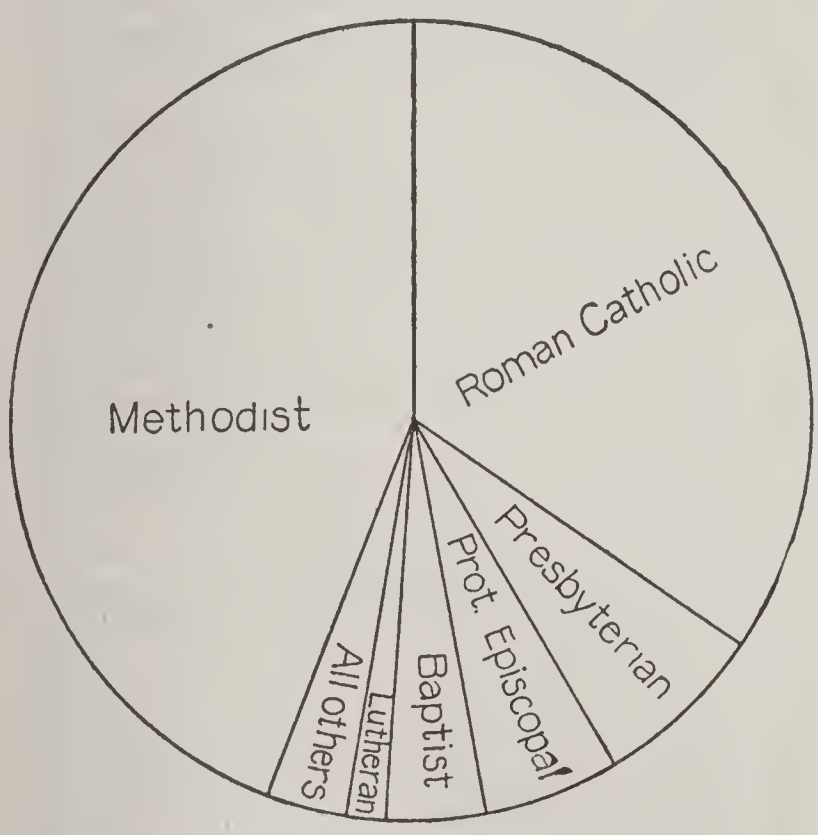
The fisheries of Delaware are growing, although they have not as yet reached especial

importance. Their products are valued at about $545,000 a year, the most important fish taken being menhaden, oysters and shad.

Transportation and Commerce. No part of Delaware is far from navigable water or from railways which afford connection with the largest railways of the East. The total railway mileage is about 400, the two most important railroads being 275 miles of the Pennsylvania system, and the Baltimore & Ohio. There are only about 125 miles of electric railway, although extensions are being made at a comparatively-rapid rate.

An active coastwise trade exists between Wilmington and New York, those cities being connected by a line of steamers. There is also some foreign commerce through Wilmington. Chesapeake and Delaware bays are connected by a canal. The harbors at New Castle and Lewes encourage coastwise and internal trade. Recent government appropriations provide for improving the harbor at Wilmington and for dredging channels in several of the larger streams in the state.

The People and Principal Cities. Fifteen per cent of the population of Delaware are colored. Of the white population about eight per cent are foreign-born, chiefly of Irish, German, English and Italian parentage.



RELIGIONS IN DELAWARE

The city of Wilmington, in the extreme north of Delaware, is the largest city. Dover, in about the center of the state, is the capital, and other cities of importance, besides the harbor towns of New Castle and Lewes, are Milford, Middletown, Smyrna, Georgetown, Seaford and Laurel. The most important of these are described in these volumes.

Education. Although education in Delaware has long been the subject of thoughtful care and constant improvement, yet more efficient instruction of the young is promised. Coöperating with the United States Bureau of Education, the Delaware state school system is being built up as a model educational unit, and it is probably destined to serve as a guide to other commonwealths which may desire a more thorough and united educational system than they now possess. All schools, from little district schools to the State College for Colored Students at Dover, and the Delaware College for men at Newark, will be included in the new plans.

A law passed by the legislature in 1907 makes school attendance compulsory for children between the ages of seven and fourteen. School sessions in rural communities vary from seven to ten months a year, and children living over two miles from a school are excused. Separate schools are provided for white and colored children. Over 22,500 children attend the public elementary schools, and about 1,800 pupils are taught in the high schools. The state has no normal schools, but has a normal department in the Women's College at Newark. Under the new educational system proposed this plan will doubtless be altered.

The state supports a hospital for the insane and an industrial school for boys and one for girls. It contributes to institutions outside of the state for the support and training of its deaf, dumb and blind.

Government. After being governed under three constitutions, adopted in 1776, 1792 and 1831, Delaware adopted a fourth in 1897, and this, with a few minor amendments, constitutes the basic law of the state to-day. Delaware is divided into three counties, and each of those into hundreds, or districts, for local government. Wilmington has a specially modified government of its own.

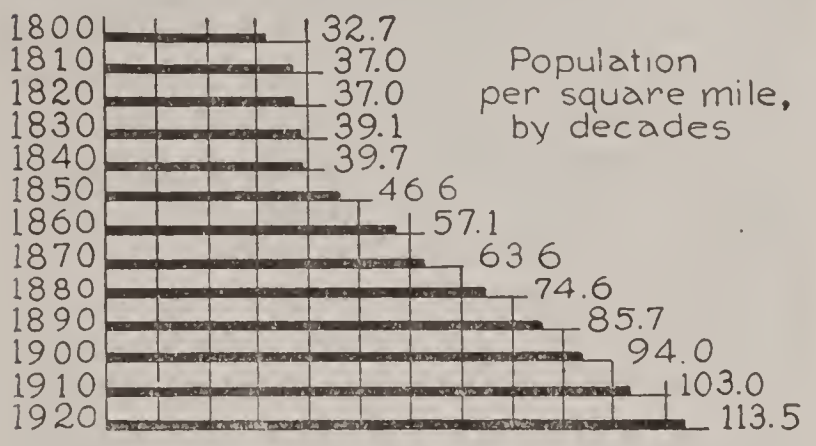
Executive power is vested in a governor, lieutenant-governor, attorney-general and insurance commissioner, each elected for four years, and in a state treasurer and an auditor of accounts, who serve two years.

The legislative power is vested in the general assembly. It consists of a senate of seventeen members, elected for four years, and a house of representatives of thirty-five members, elected for two years. Senators must be twenty-seven years old and representatives

twenty-four. A voter must be twenty-one years of age and able to read English and to write his name. Every male citizen with those qualifications is entitled to vote in the election district in which he registers, if he has been a resident of the state one year, of the county, three months, and of the district, or hundred, thirty days, next preceding the election.

Judicial powers are vested in six judges, one of whom is chancellor, one chief justice, and the other four associate justices. All are appointed by the governor and confirmed by the senate.

History. Although the Englishman, Lord de la Warr, sailed into Delaware Bay in 1611, the first settlement in the colony was made by the Dutch, just twenty years later. That trading post, which was situated near the



SHOWING INCREASE IN POPULATION

present site of Lewes, was destroyed by Indians in 1633. In 1638 the Swedes made an attempt to secure a shore line in America by founding the colony of New Sweden, near the present site of Wilmington and extending as far as Philadelphia. The Dutch resented this invasion of what they considered their property, and within four years open conflict ensued. By 1655 the Swedes were driven out, and the Dutch took possession of all that section. When New Amsterdam, the present New York City, passed into English hands in 1664, Delaware also came under English control, and contention arose between the Duke of York and Lord Baltimore. In 1683, however, William Penn secured the territory, and for twenty years it was governed as part of Pennsylvania. In 1703 it was granted a separate assembly, but the authority of Pennsylvania's governor was acknowledged until the Revolutionary War. Throughout that war Delaware soldiers rendered noteworthy service. In 1776 an independent state government was formed, and Delaware was the first state to ratify the Federal Constitution in 1787.

As a slave-holding state, Delaware furnished

Research Questions on Delaware

(An outline suitable for Delaware will be found with the article "State.")

Why has Delaware fewer navigable streams than it had two centuries ago?

Do the farmers of the state have to provide for irrigation?

How many miles of railroad are there to one hundred square miles of area? How does the state compare in this regard with the state which most closely resembles it in size? With California?

Who was the real discoverer of Delaware Bay? Why did he not explore it?

What qualifications must a man have to enable him to vote in Delaware?

Where is the great breakwater? How much did it cost, and how long was it in building?

Who are the "white Indians," and what has tradition to say concerning them?

What industrial plant in this state outranks in age and size all others of its kind in the country?

What is meant by "hundreds"?

Has the state many navigable waterways?

What incident in the history of the American flag is marked by a monument in this state?

How many dollars' worth of manufactured goods is produced in Delaware for each working day in the year?

How does the state care for its blind and its deaf and dumb?

How many times as valuable as its yearly mineral output is its agricultural production? The output of its factories?

To what children within the state does the compulsory education law not apply?

Give two popular names applied to this state, and explain both.

In what unusual way was the northern boundary of the state established?

What do the farms produce that is not counted as agricultural products?

How many states have a greater proportion of their land under cultivation than has Delaware?

What fruit is most closely associated in the popular mind with this state? Is it the most important now?

How many cities in this state have a population greater than 10,000?

How many cities the size of the capital of Delaware would the capital of New York make?

At what stage has the state arrived on the liquor regulation question?

How many states have a population smaller than that of Delaware? How many have fewer people to the square mile?

What proportion of the total agricultural output is made up of cereals?

What engineering project besides the breakwater at Lewes has been of great aid to transportation?

Who made the first settlement on Delaware territory? When? How did the land come into the possession of England?

many recruits to the Confederate army during the War of Secession, but as a government it remained faithful to the Union and was quick in its response to the call for troops. In recent years political factions of the Republican party have fought for control of the state, and as a result Delaware was without representation in the United States Senate from 1901 to 1903. A troublesome question is liquor regulation, and as a result of the elections of 1910 licenses are required for the sale of liquor in New Castle County, including Wilmington, while Kent and Sussex counties continue to be anti-saloon territory. E.D.F.

Other Items of Interest. Hudson discovered Delaware Bay and explored its mouth six days before he entered the Hudson River, but he did not proceed far inland because the bay was too shallow.

The Indians who lived in this region at the coming of the white man were the Lenni Lenape, or "real men."

In Sussex County and the surrounding region there is a colony of so-called "white Indians" or "Moors." Tradition declares that these are the descendants of Moors from Spain, but their exact origin is unknown.

It was during a battle on Delaware soil that the new American flag was first unfurled on land, September 3, 1777. The spot where this occurred is indicated by a monument.

Only one city in the state—Wilmington—has more than 5,000 inhabitants.

When the white men first entered this territory it was far better watered than at present. Forests have been cut and swamps have been drained, and in the process many streams have disappeared, while others, once navigable for large vessels, are now of use only for the smallest craft.

No other state has so large a proportion of its land under cultivation.

Because of its diminutive size, Delaware is frequently known as "The Diamond State."

More than one-sixth of Delaware's area, or 405 square miles, is water surface.

Consult Pyle's *Once Upon a Time in Delaware;* Conrad's *History of the State of Delaware.*

Related Subjects. The following articles in these volumes, even when they do not make specific mention of Delaware, contain information which will help to make clearer the life and activities of that state.

Apple	Leather
Delaware, Thomas West	Peach
Delaware Bay	Powder
Dover	Wilmington

DELAWARE, a tribe of American Indians belonging to the Algonquian family, living, when first known, on the Delaware River. They called themselves *Lenni Lenape,* which meant *real men.* They occupied Eastern Pennsylvania and most of New Jersey. It was with these Indians that William Penn made his celebrated treaty, and from their great chief Tamanend the Tammany Society (which see) of New York takes its name. Because they occupied the central home of the Algonquians they were given the title of *grandfather* by all the tribes of that great family. Driven from their original home by the progress of the whites, they removed westward. Fewer than 2,000 now remain, and they are scattered among other tribes. For habits and customs, see INDIANS, AMERICAN. See, also, PENN, WILLIAM.

DELAWARE, a river of the Eastern United States, formed by the junction of two small streams in the Catskill Mountains, New York. This river is the greatest shipbuilding center, after the Clyde, in the world. It forms the northeastern boundary between New York and Pennsylvania and the entire boundary line between Pennsylvania and New Jersey. Its general course is southward, passing through the Kittatinny Mountains near Stroudsburg, Pa., and flowing through the gorge known as the Delaware Water Gap (which see). Its length is about 350 miles from its source to Delaware Bay, into which it flows about five miles below New Castle. The Schuylkill and Lehigh rivers are its most important tributaries. Tidewater is met at Trenton, after which it becomes an inlet of the sea; Philadelphia, fifty-five miles above the head of the bay, is at the head of navigation for ocean steamers. The river is an important means of commercial transportation for the busy cities of Trenton, Easton and Camden. The Morris & Essex Canal from Trenton to New Brunswick also facilitates commerce, and the Delaware & Chesapeake Canal connects Delaware River with Chesapeake Bay. The state of Pennsylvania made a large appropriation for river and harbor improvements south of Philadelphia in 1905.

DELAWARE, OHIO, the county seat of Delaware County, twenty-four miles north of Columbus, the state capital, 116 miles southwest of Cleveland and 100 miles south and east of Toledo. It is on the Whetstone (Olentangy) River, and on the Cleveland, Cincinnati, Chicago & Saint Louis, the Pennsylvania and the

Hocking Valley railroads, and on two interurban lines. Delaware was named for the tribe of Indians of that name. It was laid out in 1808, incorporated as a town in 1815 and as a city in 1827. The area is four square miles. The population, practically all American, was 9,076 in 1910 and 9,790 in 1916.

Delaware is the seat of the Ohio Wesleyan University (Methodist Episcopal), opened in 1844. Gray Chapel, the main building, was erected in 1892 at a cost of $350,000. The city has a Federal building, erected in 1910 at a cost of $75,000, a Carnegie Library and two attractive parks.

The industrial enterprises include manufactures of clay products, gas engines, shoes, cigars and garments; the city also has railroad shops, foundries and limestone quarries. There is a lively trade in the agricultural and stock-raising products of the surrounding country. In the city are sulphur and other mineral springs, whose waters are utilized for medicinal purposes. One of the finest sanitariums in the state is located here.

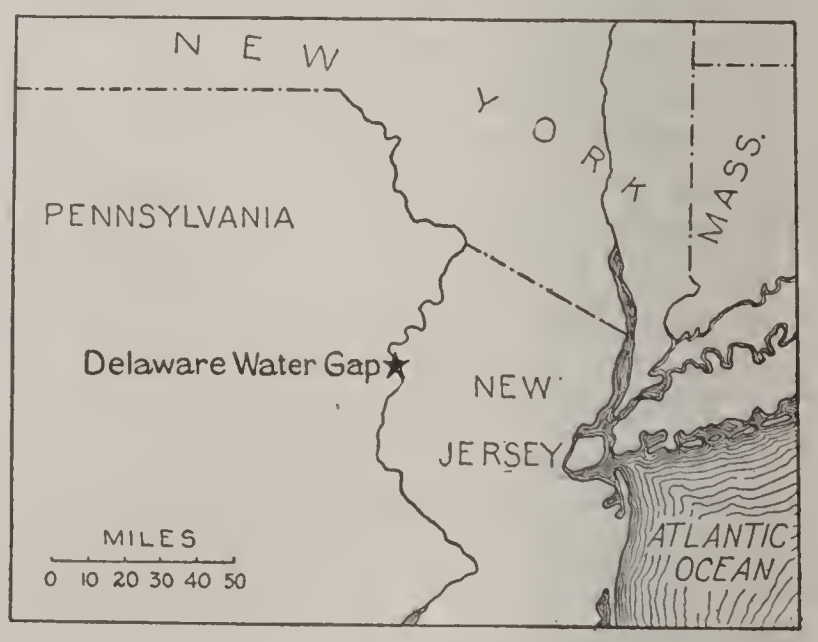
Delaware was the birthplace of Rutherford B. Hayes, President of the United States from 1877 to 1881. The house in which he was born stands opposite the city hall (see HAYES, RUTHERFORD B., for illustration). W.D.T.

DELAWARE, or **DE LA WARR,** THOMAS WEST, Lord (1577-1618), an English nobleman of colonial fame, the first governor of Virginia colony, in whose honor the state of Delaware and Delaware River and Bay were named. At the age of twenty-five he succeeded to his father's estate and title and became a member of Queen Elizabeth's Privy Council. Having become interested in the plans for the colonization of the new lands in America, he was chosen a member of the Council of Virginia in 1609, and on June 10, 1610, arrived at Jamestown as the first governor of the Virginia colonists. He first persuaded the discouraged settlers to give up the idea of returning to England, and then set himself to the task of bringing order and prosperity to the weak settlement. In this he succeeded admirably, though he was much given to pomp and display.

After founding a settlement on the site of the modern Hampton, and building forts Henry and Charles, Lord Delaware started for the West Indies in 1611 to restore his failing health, but was driven by a storm into the river which now bears his name. He then returned to London, where he published his *Relation of the Condition of Affairs in Virginia.* In 1618, while on a second voyage to America, he died.

DELAWARE BAY, a large bay or arm of the Atlantic Ocean, lying between the states of Delaware and New Jersey. It is about forty miles long and thirty-five miles at its greatest width, and has a channel depth of thirty to sixty feet through its entire length. The bay is of great commercial importance, as it enables ocean-going vessels to reach Philadelphia, which lies on the Delaware River a few miles above the point of its entrance into the bay. Philadelphia contends with New Orleans for the rank of second seaport in the country, New York holding first place. At the entrance of the bay, near Cape Henlopen, the Federal government has built a large breakwater to provide shelter for vessels, at a cost of $3,000,000. Lighthouses have also been erected to warn ships of shoal water.

DELAWARE WATER GAP, a narrow gorge about three miles long, in the Kittatinny Mountains, sixty-five miles west of New York, close to the boundary between New Jersey and Pennsylvania, but in the latter state. This



LOCATION MAP

gorge, or canyon, was worn through the solid rock of the Appalachian range many ages ago by the Delaware River when it was slowly forcing its way to the sea. The rocky walls on either side are very steep and high, rising almost perpendicularly 1,400 feet above the water. The scenery is very beautiful, and the surroundings are restful, two facts which combine to make Delaware Water Gap one of the most popular resorts in America.

DELCASSÉ, *del ka sa',* THÉOPHILE (1852-), a French statesman who was instrumental in developing a friendly understanding or "entente" among France, Russia and England, which cemented their interests when the

War of the Nations began in 1914. In 1894 he was appointed Minister of Colonies and in 1898 received the portfolio of Minister of Foreign Affairs. He arranged the alliance with Russia, conducted delicate negotiations with England concerning African affairs and acted as mediator between Spain and the United States. By seeking European alliances he roused the suspicions of Germany and his resignation was called for. He was soon reinstated, and in 1911 became Minister of Marine, in this position effecting great improvements in the French navy. In 1912 he again became Minister of Foreign Affairs, but during the next year was appointed ambassador to Russia.

In 1914 Delcassé returned to France, and was for a few months Minister of Foreign Affairs and then Minister of War. On the outbreak of the War of the Nations he again assumed charge of the foreign office, where he remained until October 13, 1915. He then resigned, ostensibly because of ill health; it is generally understood, however, that his resignation, like the withdrawal of Sir Edward Carson from the British Cabinet, was a protest against the hesitating policy which had allowed the conquest of Serbia by the Austro-German and Bulgarian armies.

DEL'EGATE, a person appointed by another or by a group, to act as his or its representative. The word is derived from the Latin *delegatus,* the past participle of the verb which means *to send,* or *appoint.* In the United States Congress the term is applied to a person elected to represent a territory, as distinguished from a state, in the House of Representatives. Each territory is entitled to send one delegate, who serves two years, receives a yearly salary of $7,500, is allowed to speak and offer motions only on affairs concerning his territory, but may be appointed to certain committees. No delegate, however, may vote on any question. In Congress at the present time there are delegates only from Alaska and Hawaii. The Philippine Islands and Porto Rico send "resident commissioners to Congress." These men, though popularly called delegates, do not possess the rights of the territorial delegates, but are merely entitled to the privileges of the floor.

DELFT, or **DELF,** a picturesque town in the Netherlands, near Rotterdam, founded in the eleventh century. It is intersected by numerous tree-bordered canals crossed by sixty-nine bridges. Among its buildings of historic interest are the Prinsen-hof (meaning *court of a prince*), now a fine museum, where William I of Orange was assassinated in 1584; the town hall; the old Reformed church; and the new church containing the family vault of the House of Nassau, the tomb of William I, the remains of Hugo Grotius, a Dutch statesman, and the burial vaults of the present royal house. The town was at one time famous for the manufacture of a beautiful pottery, the appearance of which, in about 1600, marked an epoch in the art of ceramics. This earthenware in its highly developed form successfully imitated Chinese blue and white porcelain. The industry, which suffered a severe decline in the latter part of the eighteenth century, has been revived, its product receiving the name of "New Delft."

DELHI, *del'e,* capital of the Indian province of the same name, since 1911 the seat of government of British India. It is situated on the west bank of the River Jumna, about midway between Calcutta, on the east, and Karachi, on the west coast. The city was founded by Shah Jehan, builder of the beautiful Taj Mahal (which see) at Agra and of the imperial palace at Delhi, the latter a reminder of the days when the city was the splendid capital of the great Mogul empire, with a population of 2,000,000 (see MOGUL). This palace has given place to British barracks, and few evidences of its former glory are visible. Here, in the audience chamber, once stood the famous Mogul throne, surmounted by a fully-spread peacock's tail made of precious stones and valued at $30,000,000. Near the finest street in Delhi, called the Chandni Chauk, stands the Great Mosque, a beautiful building with three pure-white marble domes. This is also a monument to the pride of Shah Jehan, who on his coronation treated the populace of Delhi to a pageant that cost him more than $6,000,000.

In 1911 the city witnessed another pageant, known as the Delhi Durbar, when King George V and Queen Mary of England were entertained with great splendor (see DURBAR). For political reasons at that time it was thought wise to remove the capital from Calcutta to Delhi, and this was done in the following year. Modern Delhi is far from being the glorious city of old. It is, however, in a fairly flourishing condition. The palaces of the nobles and princes have in many parts given place to the dwellings of European business men. Although the city is still famous for its jewelry and gold and silver work, Western

manufactures have become more important. Modern flour mills look down on the sumptuous dwellings of caste-encircled natives who regard commerce as degrading. Sugar and cotton mills, with up-to-date machinery, provide employment for many thousands of low-caste inhabitants. The trade in grain and other agricultural products is extensive.

Educational facilities have been greatly increased during recent years, and Delhi, by being created the capital of the vast Indian Empire, has developed a civic pride which bids fair soon to place the city far ahead of all Indian rivals. It is more cosmopolitan than most of the Indian cities; racial and religious prejudices, though they exist, are not as apparent to the observer as elsewhere. The political unrest that was formerly characteristic of the city is gradually giving way to a desire for educational and commercial progress. Population in 1921, 303,148.

DELI'LAH, in Scripture, the treacherous mistress of Samson, the man of marvelous strength. Desiring to know wherein the strength of Samson lay, the lords of the Philistines bribed Delilah to discover the secret. Loving and trusting her, Samson told Delilah that his strength came from his long, thick hair; so while he was sleeping Delilah cut off his locks, and he fell into the hands of his enemies. Under the title SAMSON in these volumes is told the story of his revenge for this outrage.

The name Delilah means *drooping,* or *languishing, one.* Delilah is a leading character in Saint-Saëns's opera, *Samson and Delilah.*

DELIRIUM TREMENS, *delir'ium tre'menz,* or **SHAKING DELIRIUM,** is an affection of the nerves and brain, caused by long-continued and excessive drinking of alcoholic liquors. The sufferer has fits of trembling, and his mind becomes so disordered that it is filled with all manner of fantastic imaginings. Frequently he thinks he sees snakes, rats, bats and other loathsome animals, and as a result he suffers greatly from lack of sleep. Unless the progress of the hallucinations is arrested the victim eventually dies in agony of mind and from physical exhaustion. Strychnine, chloral, bromides and other powerful drugs are usually administered to the patient, but the treatment should always be directed by a physician. Baths and douches are sometimes found to be of benefit. It is estimated that about seventeen per cent of those attacked by delirium tremens die from its effects. W.A.E.

DE'LOS, the smallest and the central island of the Cyclades group, in the Aegean Sea, belonging to Greece. It was held in great veneration by the ancient Greeks as a sacred island, the birthplace of the god Apollo. Tradition says it was originally a floating island but was anchored in its present position by Neptune, called Poseidon by the Greeks, to afford a refuge for Leto, mother of Apollo and Artemis. In 477 B.C. the Greek cities formed a league known as the Confederacy of Delos, for protection against the Persians. The common treasury was kept in the temple of Apollo on the island of Delos, which became the political and educational center of all the Grecian states. The power of the league was later transferred to Athens, leading to the foundation of the Athenian Empire.

DELPHI, *del'fy,* an ancient town in Phocis, Greece, called Pytho in the stories of Homer. It was celebrated for its oracle of Apollo (see ORACLES), through which it became the religious center of Greece and the common altar of the Greek race. Delphi lay on the southern slope of Mount Parnassus, in a region of wild and picturesque beauty. From a deep crevice in the rocks issued overpowering vapors, assumed to be the divine breath of Apollo, and over this spot a temple was erected in honor of the god. The priestess, known as the Pythia, who received the messages of the Revealer, sat upon a tripod over the crevice, and as she came under the influence of the stupefying vapors gave utterance to his words. Her mutterings were recorded by priests, who interpreted them in verse.

Though the answers were sometimes in the form of sensible advice, prophecies regarding the outcome of future events were often intentionally obscure or capable of being taken in different ways. Croesus, asking if he should make war on Cyrus, was told that if he did so he would bring ruin to a great empire; in the struggle that he at once brought about it was his own empire that was destroyed. Not only did the Greeks freely consult the oracle, but in times of peril and anxiety the Romans and the monarchs of Asia made their way to Delphi.

DELSARTE, *del sahrt',* **SYSTEM,** a system of relaxing physical exercises, including training in poise and breath control, devised by François A. Delsarte (see below). He taught that every expression of the face, every gesture and every pose of the body was the outward expression of some inner emotion, and that every gesture, every pose and every expression

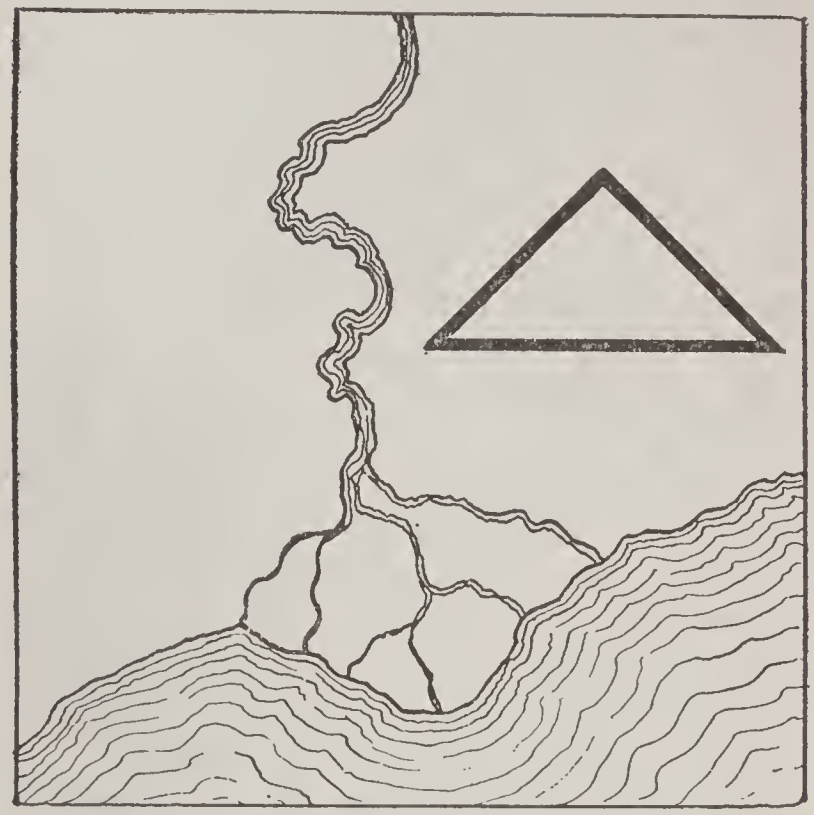
of the features had a characteristic effect on the emotions and on character. He was therefore a teacher of emotional expression.

His first step was to subject the joints and muscles of the body to a relaxing process, to secure perfect freedom of movement and to make the human organism pliable and responsive. His exercises are simple, and include special movements for the fingers, hand, head, trunk, foot, leg, lower jaw, eyelids, etc. The Delsartian movements develop grace and freedom of gesture, but they are not a system of gymnastics, nor are they adequate for the complete training of the physical organism.

François Alexandre Delsarte (1811-1871) was born at Solesmes, France. During a boyhood which was full of poverty and suffering, he developed a remarkable talent for music. Through the influence of a well-known musician, who discovered him writing down in the sand the music that was being played in the garden of the Tuileries, he was admitted to the Conservatory of Paris at the age of fourteen. Five years later he became a singer in light opera, but in 1834 was forced to leave the stage because of the failure of his voice. Thereafter he devoted himself to perfecting his system of expression, which he never put into writing, but which has been handed down by his followers. Among his pupils were the famous French actress Rachel, and the great pulpit orator, Père Hyacinthe. Delsarte was the composer of a number of songs and vocal exercises, and a mass which he wrote was performed in churches.

DELTA, a triangular-shaped tract of land at the mouth of a river, so called from its resemblance to the fourth letter of the Greek alphabet (Δ), corresponding to the English *D*. The name was first applied to the silt or sand deposits built up into a fan-shaped plain at the mouth of the Nile. Since that time the same name has been given to alluvial deposits frequently found at the mouths of large streams flowing into lakes or gulfs, where the effects of tides and currents are comparatively slight. The main stream usually divides into two or more branches, each of which may be divided again and again. The size of the delta bears a close relation to the strength of the current in the body of water, as a swiftly-flowing current carries off the shore line deposits, forming sand bars or coast islands, while slow or sluggish currents build deltas of considerable size.

The delta of the Mississippi has an area of about 12,500 square miles, many thousands of acres being productive land, and it is advancing into the Gulf of Mexico at the rate of one mile in sixteen years. The Nile delta, which has an area of 10,000 square miles, is very fertile. Other noted deltas include those of the Hoang-ho, Ganges and Po. As large



A CHARACTERISTIC DELTA
The upper figure represents the Greek *delta.*

rivers often change their channels near their mouths, delta lands are unsafe for dwelling places because of the danger of floods, but owing to their high fertility they can be used for agricultural purposes if of sufficient elevation to be drained. See River; Erosion; also illustration of the delta of the Mississippi River, in article bearing that title.

DELUGE, *del'uje,* from Latin words meaning *to wash away,* is the name given to the great Flood described in the Old Testament. According to the Bible narrative, thousands of years before Christ the waters covered "all the high hills that were under the whole heaven" and destroyed all living things except those that had been permitted to seek refuge in the Ark built by Noah.

The familiar story, told in chapters VI, VII and VIII of *Genesis,* is one of the most vivid and fascinating of all Bible tales. According to the account, the Deluge was sent to punish the wickedness of men among whom only Noah and his family were deemed worthy of being saved. With them in the Ark were one male and one female of each living species. For forty days and nights the flood rose, "the fountains of the great deep were broken up, and the windows of heaven were opened."

After 150 days the waters began to subside,

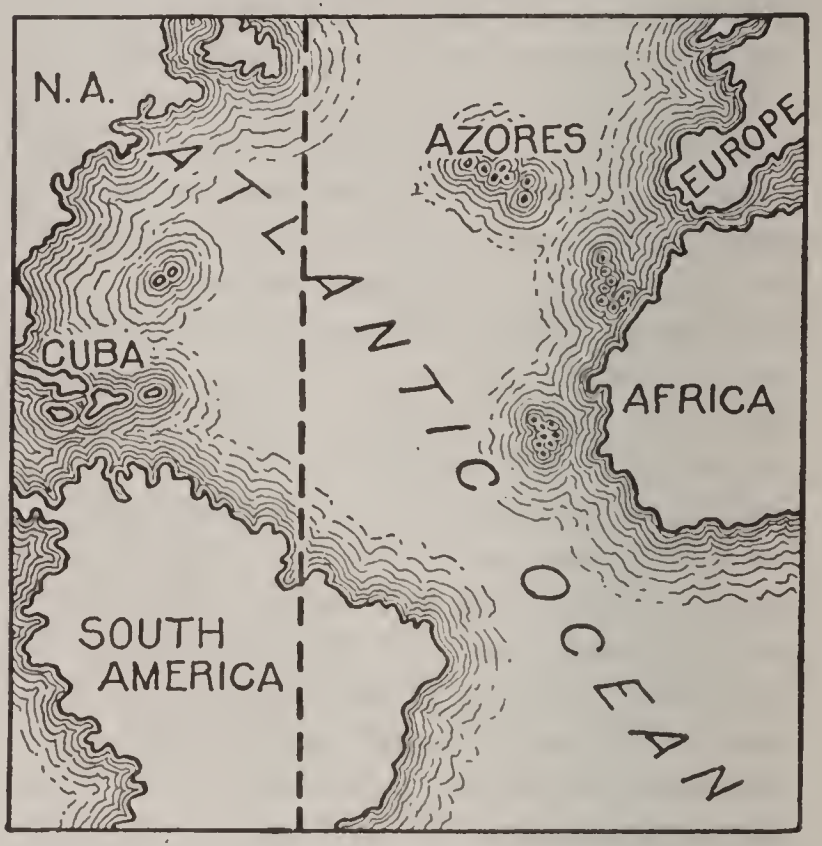
and in the seventh month the Ark rested on Mount Ararat. "Noah's dove," sent forth to test whether the earth were once more fit for habitation, returned after the first trial to find shelter and food in the Ark; the second time it came back bearing an olive leaf; the third time it did not return—a sign that the land was dry and beginning to yield as of old. Then, after having been a year and ten days in the Ark, Noah and his family again set foot upon the new earth, offered thanksgiving to God, and received the promise expressed in the rainbow, that "the water shall no more become a flood to destroy all flesh."

The literal interpretation of the Biblical statement that the Flood covered the entire earth has been modified to harmonize with modern geological discoveries concerning the age of rock strata. Bible commentators now generally agree that either the narrative in *Genesis* described a flood of only local extent, or that the phrase "all the earth" was only relative, since only a small portion of the earth's surface was then known and inhabited.

Nearly every nation has in its folklore a flood tradition similar in many respects to that of the Hebrews. The Greeks had the story of Deucalion's flood, told by the poet Ovid and familiar to students of Greek mythology. Babylon, India, China, Persia, Syria, Polynesia, and even ancient Mexico, Peru and Cuba had their deluge legends. The Babylonian story exerted a strong influence on the Hebrew tradition, and because of its earlier dating it is thought by many to have been the model for the Bible narrative. The clay tablets on which the Babylonian, or Chaldean, account is engraved are known as the Deluge Tablets. Fragments have been unearthed and deciphered at various times, the first translation having been published in 1872 by George Smith, a famous English scholar in Assyriology, and others more recently, in 1910 and 1913.

Celebrated paintings of the Flood are those of Poussin, in Paris, and of Raphael, in the Vatican at Rome. L.M.B.

DEMARCATION, *de mar ka'shun,* LINE OF, the historical name of the boundary line established by Pope Alexander VI to settle the conflicting claims of Spain and Portugal to lands in the New World. By a Papal bull issued in May, 1493, he assigned to Spain all the lands its navigators had discovered, or might discover, west of a line running from north to south 100 leagues west of the Azores and Cape Verde Islands, provided such lands had not previously been in actual possession of any Christian prince or king; Portugal was to possess all the land discovered under the same conditions east of that line. After this concession Spain's possessions were known as the West Indies and those of Portugal as the East Indies. This arrangement proved unsatisfactory to Portugal, and the two countries in 1494 sent commissioners to Tordesillas, a Spanish city, and they succeeded in establishing the line 370 leagues west of the Cape Verde Islands.



LINE OF DEMARCATION
The Pope's division of the Western world, as decided in 1494.

Portugal, on the strength of the extension of this line, eventually claimed and secured Brazil, but disputes as to the exact determination of the line were frequent. A treaty was negotiated on April 22, 1529, at Saragossa, fixing the demarcation line 297½ leagues east of the Molucca Islands, but this arrangement was abrogated by subsequent treaties. France, England and the Netherlands, the principal colonizers of North America, paid little attention to the Papal bull.

DEMOCRACY, *de mahk'ra si,* a government in which control of affairs is vested in the mass of the people, who in their decisions are superior to the mandates of king or emperor. If a democracy exists in a country so small as to make it possible for all the people to meet to formulate policies and frame laws, that government is called a *pure democracy;* if the country is too large to make such personal action possible the laws are made and executed by representatives chosen by the people, in which case the country is a *representative democracy.*

England, France and the United States are examples of the latter; Andorra and San Marino, of the former.

DEMOCRAT'IC PARTY, officially known from the time of Washington's second administration as the Democratic-Republican party, and after 1829 as the Democratic party. It is the oldest political organization in the United States, and has been inspired by the political principles laid down by Thomas Jefferson practically since the foundation of the Federal government.

Its Origin. All men were united in their effort to establish order following the trying days of the Revolution. On the question of adoption of the Federal Constitution public opinion was divided: one group, led by Alexander Hamilton, advocated its acceptance by the states without alteration; another group declared against such centralization of power as the Constitution threatened to impose upon the country, and maintained that the states should be invested with almost sovereign authority, to assure local self-government. The champions of the Constitution won, but the opposition obtained a promise that Congress, as one of its first acts, should propose a series of constitutional amendments guaranteeing certain inalienable rights to the people. Hamilton and other spokesmen for the Constitution, in the form in which it was passed by the Convention, became known as the Federalists. The natural designation of the opposition, headed by Thomas Jefferson, was Anti-Federalist, and this party was in every essential respect the beginning of the present Democratic organization.

Its Early Development. After the Constitution was adopted the distinction between Federalists and Anti-Federalists became almost meaningless. All men joined in an effort to establish the new government as quickly as possible, and for two or three years party names were lost to view. In 1792, on the eve of the second Presidential election, there arose two active groups, the old Federalist wing becoming known as National Republicans and the followers of Jefferson as Democratic-Republicans. The former were successful in national contests until the year 1800, when the Democratic-Republican party elected Jefferson to the Presidency, and from this time party differences were more marked. All the elements in direct or passive sympathy with old Federalist tenets now aligned themselves with the National Republicans, but the hold of Jefferson and his theories upon the people was so strong that his party was retained in power through the administrations of its leader and the succeeding terms of Madison and Monroe. Chief among Democratic principles was the belief that a large army and navy were unnecessary, but emphasis was also placed on the need for economy in government, on the rights of the states and on the desirability of avoiding foreign complications.

Strict adherence to these principles embarrassed the administrations and displeased the people, for the country was humiliated in a series of international incidents which ultimately led to war with Great Britain. Although it ended successfully and left an "era of good feeling" behind it, the nation was not satisfied and in 1824 elected John Quincy Adams, the candidate of the original Federal element, or National Republican party. In this election, for the first time, Presidential nominations were not exclusively in the hands of a Congressional caucus; Adams was nominated by the state legislatures. The Democrats, largely owing to the unpopularity of the Adams administration, returned to power in 1829, with Andrew Jackson as President. During the succeeding eight years Jackson welded together a party so strong that it has continued to the present day either as the dominant party or as the strongest minority organization.

The Problem of States' Rights. Since the days of Jackson the career of the Democratic party must be divided into two parts. Until after the War of Secession the campaign issue was always concerned with slavery or the tariff, and chiefly as a phase of a greater struggle to determine the relation of the individual state to the United States. South Carolina's nullification doctrine was based on the assumed right of secession (see NULLIFICATION). Although Jackson himself had no sympathy or patience with nullification, his party gradually came into the control of men who were unwilling to interfere with state institutions. Thus it happened that the Democratic party was driven to the defense of slavery.

After the War of Secession. At the close of the War of Secession the Democratic party was in a peculiar position. The Southern Democrats were mostly disqualified from voting and from office-holding by the reconstruction measures (see RECONSTRUCTION); the Northern Democrats, as a party, were unpopular because they had opposed the vigorous prosecution of

the war. The war had ended slavery and had eliminated the threat of secession, but there remained one great issue, the tariff, from the ante-war period. On this issue the Democratic party won its only victories in national elections between 1856 and 1884. During the reconstruction period, the Democrats waged a vigorous fight against the Congressional policy of reconstruction, and later they took issue on financial measures. The inefficiency in the government under Grant gave the Democrats an issue which nearly resulted in the election of Samuel J. Tilden. Civil service reform and lower tariffs were the campaign cries which elected Grover Cleveland in 1884 and 1892, and lower tariff was the chief plank of the Democratic platform in 1912, when Woodrow Wilson was elected.

In 1916 the underlying issue was the personality of the candidates, but the Democratic party practically stood on its record, which the Republicans attacked with vigor. The campaign was notable for the large number of issues which were discussed—among them the Mexican situation, a proposed constitutional amendment to provide national woman suffrage, the threatened railway strike and the Adamson railroad labor law, and most important of all, the government's attitude toward the European nations, especially Germany. Wilson was reëlected on his plea that he "kept us out of war."

In still another way, the War of Secession marked a break in Democratic policy. From 1801 until 1861 the Democrats had been successful in every Presidential election except three. Tyler, moreover, who had been elected with Harrison on the Whig ticket, turned out to be more of a Democrat than a Whig. Before the war the Democratic was the majority party. It was essentially conservative, unwilling to advocate new doctrines; these were left to the Whigs, the Free-Soilers and the Republicans. After the war, the Democratic was a minority party; it had to march to the attack, and in consequence it gradually became more progressive, while the Republican party in its doctrines was more inclined to conservatism. Contrary to the known fact that the responsibilities of office make for conservatism, the progressive tendency of the Democratic party became more strongly marked after its return to power in 1913. This condition was generally attributed to the lesson taught by the formation of the Progressive party in 1912. The Democratic leaders realized the forward-looking tendency of the times, and set their course accordingly. See, also, POLITICAL PARTIES IN THE UNITED STATES; UNITED STATES, subtitle *History*. E.D.F.

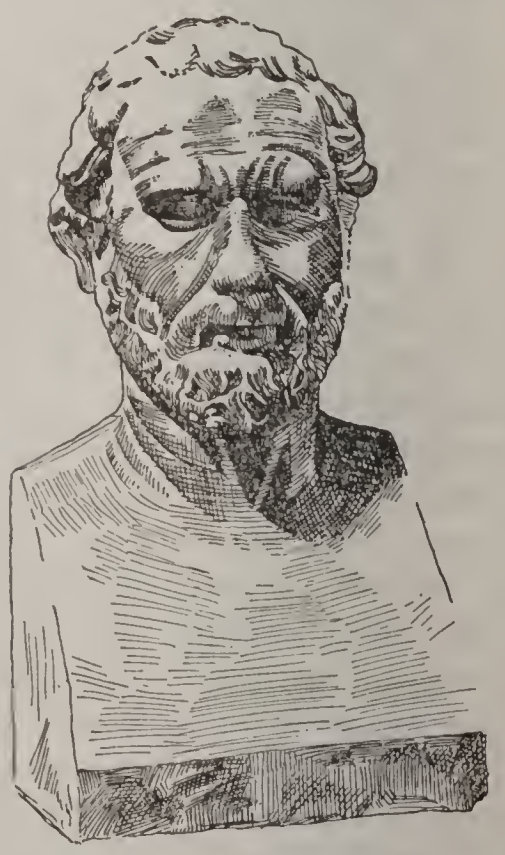
Consult Johnston's *American Politics;* Woodburn's *Political Parties and Party Problems in the United States.*

DEMONOLOGY, *de mon ol' o ji,* the belief in the existence of demons, commonly in the sense of *evil spirits.* The belief was elaborated in medieval times and led to such legends as those of Faust and the Witches' Sabbath. Its discussion is pertinent to the consideration of witchcraft (which see). See FAUST.

Relating to Various Beliefs. The articles on the following topics, while not bearing on demonology, are of interest in this connection.

Alchemy	Palmistry
Astrology	Phrenology
Clairvoyance	Physiognomy
Conjuring	Psychical Research
Divination	Psycho-Analysis
Faith-Cure	Spiritualism
Hypnotism	Subconscious
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind-Reading	Theosophy
Necromancy	Trance
Occult	Witchcraft

DEMOSTHENES, *de mos' the neez* (about 383-322 B. C.), not only the most eloquent orator of antiquity but possibly of all time, and one of the noblest characters in Greek history. He was born in Attica, the son of a wealthy manufacturer who left his property and his children to the care of three guardians who proved unworthy of the trust. When Demosthenes came of age he argued and won his first case in the law courts, a suit against the dishonest guardians. This and other successes made him resolve to enter public life, and to that end he mastered Greek law and politics and the art of oratory. Laboring under



DEMOSTHENES
From a bust in the Vatican, Rome.

disadvantages that would have discouraged the average youth—a harsh and unmusical voice, weak lungs and awkward movements—he made his name a synonym for eloquence by the severest self-discipline. The story is told that he practiced reciting as he climbed steep hills, and defied the roar of the waves upon the seashore to drown out the sound of his voice.

From the time he was twenty-five until his death Demosthenes gave himself with unselfish devotion to the cause of Greek liberty. He saw, as his countrymen did not see, that the weak and disunited Grecian states were doomed to fall a prey to the designs of Philip of Macedon, and he denounced that crafty monarch in a series of harangues, the famous *Philippics,* that have given their name to all modern speeches characterized by bitter invective. In 338 B. C., when Philip led his army through the Pass of Thermopylae and seized the city of Elatea, the orator persuaded the Athenians to form an alliance with Thebes and to fight for the freedom of Greece.

Though the allies suffered a crushing defeat at the Battle of Chaeronea, Demosthenes urged the Athenians not to lose courage and to repair their city walls. When Ctesiphon proposed that the great patriot be awarded a golden crown for his services, he was charged by Aeschines, the rival of Demosthenes, with having made an illegal proposal. To this charge Demosthenes replied with what critics agree in calling the most perfect masterpiece of oratory that has ever been delivered—the oration *On the Crown.* As a result, Aeschines left Athens and went into permanent exile.

On the accession of Alexander the Great to the throne of Macedon, Demosthenes endeavored without success to unite the Greeks against the conqueror. In 324 B. C. he was imprisoned on a false charge of having received a bribe from one of Alexander's generals, but succeeded in making his escape; the following year, on the death of the Macedonian ruler, he returned in triumph to resume his leadership in Grecian affairs. The states of Greece then united against the Macedonian general, Antipater, carrying on with him the so-called Lamian War (323-321 B. C.). The effort was disastrous, and Demosthenes, who had been the very heart of the struggle, preferring death to falling into the hands of Antipater, took his own life by poison. B.M.W.

Consult Wright's *Short History of Greek Literature;* Henderson's *Classic Greek Course in English.*

Related Subjects. The reader is referred to the following articles in these volumes:

Aeschines	Greece, subtitle *History*
Alexander the Great	Philip of Macedon

DEMUR'RER, a written statement, or pleading, in law, in behalf of a defendant, which admits the facts in evidence but denies that such facts are sufficient to maintain the issue or constitute a good cause of action or defense. Demurrers are *general,* where no particular cause is assigned, or *special,* where the particular defects are pointed out. The effect of a demurrer, when allowed, is to put an end to the suit, unless the court gives the plaintiff leave to amend or unless it is confined to only a part of the complaint. In many states it takes the place of a motion for a non-suit or order of dismissal of the suit.

DENARIUS, the name given to a silver coin of the Romans during the period of the empire and the republic. In the former period its obverse bore the heads of the emperors; later, historical and mythological characters were substituted. It was first issued in 269 B. C., and disappeared from circulation in the third century A. D. Its value was ten, and later sixteen, of the coin called *as,* equivalent to about seventeen cents in American or Canadian money. The name also applies to a small gold coin struck during the days of the empire, and to one of copper issued in A. D. 296 by the Emperor Diocletian. This latter is the penny of the New Testament.

DENARIUS OF CAESAR

DENA'TURED ALCOHOL. See ALCOHOL, subhead *Denatured Alcohol.*

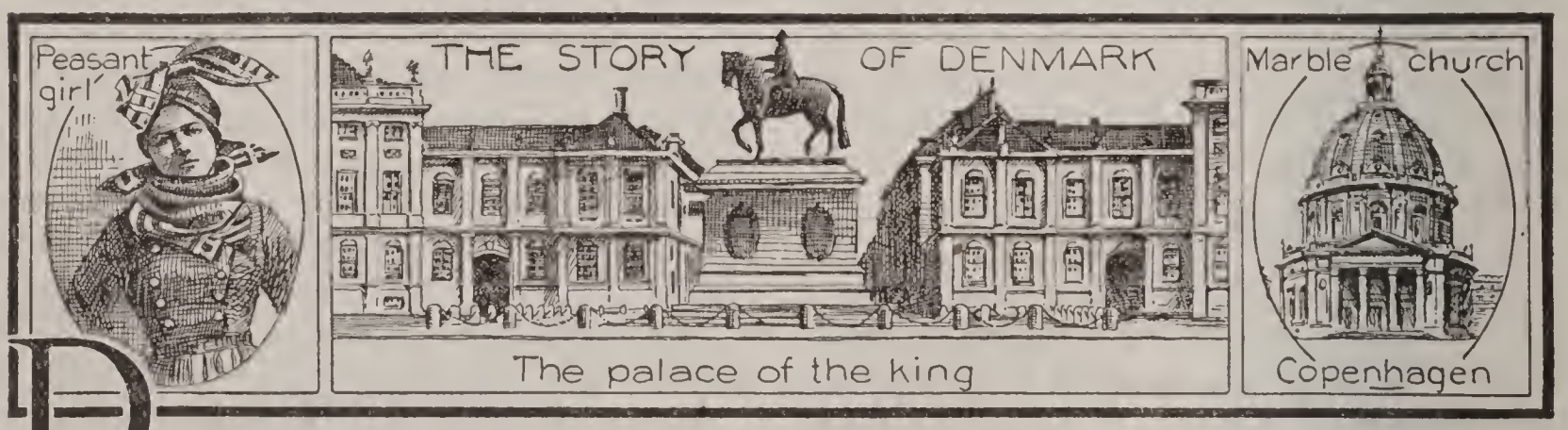
DEN'ISON, TEX., a city of Grayson County, in the northeastern part of the state, two and one-half miles south of the Red River, the Oklahoma-Texas boundary line. Dallas is seventy-four miles southwest, and Oklahoma City is 192 miles northwest. Denison is on the main lines of the Missouri, Kansas & Texas and the Saint Louis & San Francisco railways, and is the terminus of divisions of the Missouri, Oklahoma & Gulf, the Texas & Pacific, the Houston & Texas Central and the Southern Pacific railroads. The Texas Traction Company operates an electric line from Denison south to Waco, through Fort Worth and Dallas. The population of the city was 13,632 in 1910 and 17,065 in 1920. The area is over four square miles.

Denison is the commercial center of a large agricultural region. It is on the northern border of the great cotton belt. Cotton and cottonseed-oil factories, flouring and peanut mills, creosote works, grain elevators and a mattress and felt factory constitute the chief manufacturing enterprises. There are large locomotive and machine shops of four railway systems.

The Federal building, erected in 1909 at a cost of $175,000, a $250,000 union depot, a city hospital, the public library (provided by the Women's Club), a $125,000 high school, banks and hotels are among the important buildings. Denison is the seat of Saint Xavier's Academy (Roman Catholic). Forest Park and Playground, of sixteen acres, and Munson's Park, of 125 acres, are the city's recreation spots.

The early newspapers of the Southwest were the first to refer to Denison as the *Gate City,* for through it passed the pioneers who settled Texas. It was the first Texas city south of the Red River and was for many years a typical border town. The Missouri, Kansas & Texas Railroad was completed to this point in 1873, the year in which the city was founded, and the place was named for George Denison, a director of that road. It received a city charter in 1891, and in 1905 adopted the commission form of government. W.N.K.

DENISON, George Taylor (1839-), one of Canada's most patriotic citizens, well known as a writer on military history and tactics. He was born in Toronto and received his education at Upper Canada College and the University of Toronto. He was called to the bar in 1861 and engaged in active practice for a number of years. He served for forty-four years in the Canadian militia, becoming lieutenant-colonel in 1866 and honorary colonel in 1907. He took an active part in suppressing the Fenian raid in 1866 and the Riel Rebellion in Saskatchewan in 1885. In 1877 he won the grand prize offered by the Emperor of Russia for the best work on the *History of Cavalry.* This book has been translated into several languages, and is accepted as an authority on modern strategy. He also wrote a *Manual of Outpost Duties, Soldiering in Canada* and *The Struggle for Imperial Unity.* He has been president of the British Empire League in Canada since its organization in 1896, and has contributed to British and Canadian magazines frequent articles on the relationship between the colonies and the mother country. Colonel Denison has taken an active interest in the work of many literary and historical societies, has served a term as president of the Royal Society of Canada, and has been police magistrate in Toronto since 1877. G.H.L.



DENMARK, a north-central peninsula-and-island kingdom of Europe, the smallest of the three Scandinavian kingdoms. The Baltic Sea, the Sound and the Cattegat separate it from Sweden on the East; the Skagerrak lies between it and Norway on the north; and across the North Sea lies Great Britain on the west. On the southern boundary lies Schleswig-Holstein, formerly a part of Denmark; Germany lost the northern portion to Denmark by vote early in 1920. Comprising the Jutland peninsula, the Danish archipelago east of the peninsula, the island of Bornholm farther east and south of Sweden, and the Faroe Islands north of Scotland, the kingdom of Denmark covers an area of 16,609 square miles, almost twice the area of the state of New Jersey, but the population does not quite equal that of the same state. It is only about one-eighth the size of its neighbor, Norway; still its population of 3,267,831 in 1921 was greater than that of the larger country. Its lands support in prosperity and contentment 192 people to the square mile. nine times Norway's average.

The People, Their Language and Religion. Descendants of a race of heroes and conquerors, the Vikings of history and literature, the Danes are a Teutonic people, with light hair and blue eyes. They are intelligent, industrious and

hospitable. Danes make bold and hardy seamen. Their language is like Swedish and Norwegian, but more soft and rather monotonous, with shades of sound difficult for foreigners to acquire. It is the most modern of

DENMARK (IN BLACK)

Scandinavian languages and is used to a large extent by the educated classes of Norway, where it became the written language through the one-time union of Norway with Denmark. It is written either in German or Roman characters. The established religion of Denmark is Lutheran, but all creeds are tolerated.

Colonies. Besides the territory described, Denmark possesses territories covering an area of about 86,575 square miles, about one-third the area of Texas, with a population of nearly 125,000, an average of not even two to each square mile.

Iceland, the most thickly-populated, but second in size, of Denmark's colonies, came under the crown of Denmark in 1280, and although it was lost to England during the Napoleonic wars, was under direct Danish rule almost continuously until home rule was granted it in 1874. This island is situated 500 miles northwest of Scotland.

Greenland, the largest island of the world, is the largest of Denmark's colonies and also the most thinly-populated, for it is in an Arctic region, covered deep by the ice that for long ages has accumulated upon its surface. Its southern end is not far from Northern Labrador; its northern extremity lies in unexplored regions. This land of the Eskimo and polar bear is directly under the government of Denmark and became one of that kingdom's possessions during the eighteenth and nineteenth centuries. Its trade is a state monopoly.

Three islands of the West Indies, Saint Croix, Saint Thomas and Saint John, belonged to Denmark until 1917, when by sale they were transferred to the United States for $25,000,000. See West Indies, Danish.

Physical Features of Denmark. Denmark, islands and mainland, is a part of the Baltic Plain. For the greater part it is built up of the sand tossed up by the sea and blown inland by the winds. From the low, sandy west and northwest coasts of Jutland, the mainland of Denmark, which covers almost half the surface of that peninsula, is a region of fiords and dunes and shallow lagoons, or inclosed bays, which are useless as harbors. But continuing east across the peninsula and throughout the islands of the archipelago are found rather fertile lowlands dotted with ridges of hills. Of especial note is the range of hills across the middle of Jutland, the highest point of which is about 600 feet above sea level.

The eastern coasts, especially of the islands, have several excellent harbors, the most important belonging to Zealand Island, at Copenhagen, the capital of Denmark. Stretching across Jutland from the east are interesting fiords, the most remarkable being the Liimfiord, which, winding in and out, crosses the entire peninsula at the north. The largest islands of Denmark, Zealand and Fiinen, divide the outlet of the Baltic Sea into three belts, from Jutland to Sweden—the Little Belt, the Great Belt and The Sound.

Although there are many streams and lakes in Denmark well stocked with fish, the only river of note is the salmon-stocked Guden, eighty miles long, which is navigable part of its length. About five per cent of the area of Denmark is forested, beech trees being most abundant. The land surface consists largely of clay and sand, and in the west and north of Jutland are moorlands of peat.

Climate. The land of the sturdy Dane is one of frequent heavy rains and mists, and it has a climate much like that of Eastern Scotland. The average temperature in summer is 60° F., and in winter 32° F.; the annual rainfall ranges between twenty-one and twenty-seven inches. In Jutland sand storms are often experienced, and the climate there is never as mild as on the islands.

Industries. A journey through Denmark shows it to be an agricultural country. Almost everywhere may be seen fields rich with oats, barley, rye, wheat, potatoes and beets, and pastures and meadow lands dotted with grazing

cattle. Eighty per cent of the area of Denmark is productive; six per cent is beech-covered forest land. Nearly forty per cent of the population lives directly by agriculture, and as the law forbids the forming of large estates the number of peasant farmers is large. The progressive Danes believe in coöperation, so expensive machinery and improved methods have been installed through the united efforts of the farmers, and the dairying industry has grown to wonderful proportions. Danish butter is famous even outside of Denmark; more than $50,000,000 worth of butter and almost $12,000,000 worth of eggs are sent each year to England alone. About 30,000 horses and 153,000 heads of cattle are exported yearly.

Although manufacturing industries are growing, the lack of coal has been a handicap to their development. The principal manufactures are furniture, porcelain and wearing apparel. Yet much of the latter is not dependent on power produced by fuel, but comes from the knitting needles of the female population, from tiny girls to their grandmothers. Many peasants also spin and weave in the old-fashioned way.

The royal porcelain works at Copenhagen have a large yearly output of gracefully-designed pottery. Other manufactures include over 160,000 tons of beet sugar and various kinds of machinery. Denmark is the poorest of European countries in mineral resources, no metallic ores being found; the peat bogs of Northern and Western Jutland furnish the most valuable yield.

Fishing is an important industry, herring, turbot, salmon, oysters and seals being the most profitable. The yearly value of Denmark's fisheries is about $5,000,000.

Transportation, Communication and Commerce. The internal traffic of the kingdom is handled over 2,660 miles of railway, more than half of which belongs to the state. There are more than 4,700 miles of good roads and 23,600 miles of by-ways. Plying back and forth between the islands and the mainland, steamers keep up constant intercourse among the various cities, most of which are located on the coast or on navigable waters. There are over 1,362 post offices, nearly 9,000 miles of telegraph wires and about 350,000 miles of telephone wires.

The commerce of Denmark and its colonies, conducted chiefly with Great Britain, Germany, United States, Sweden, Norway and Russia, is handled by over 32,000 vessels. The chief articles of export are animal and dairy products, and the imports include cereals, cotton, iron and textiles.

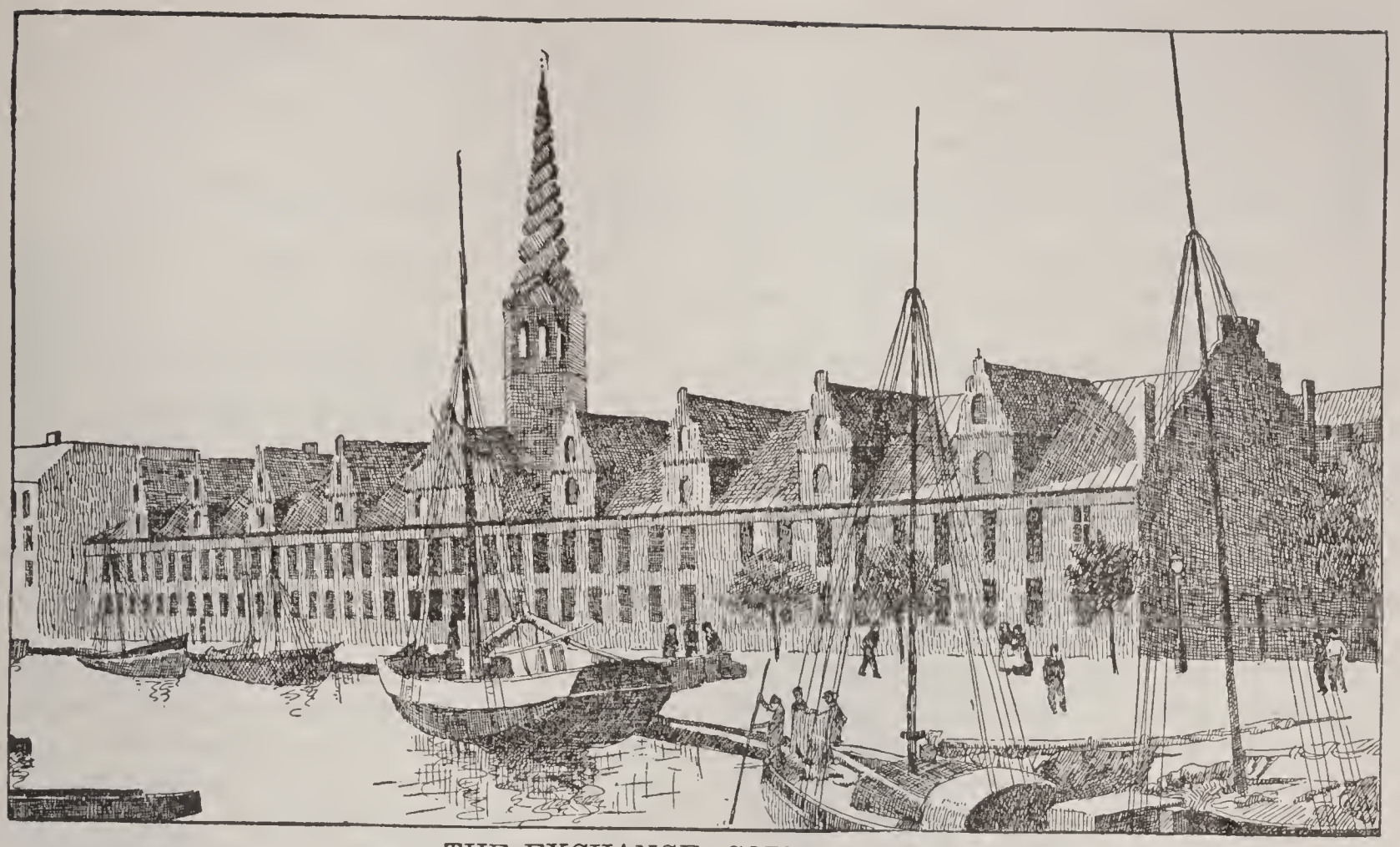
Education. Provisions for public elementary education were made in the beginning of the nineteenth century and in 1814 school attendance for children between the ages of seven and fourteen was made compulsory. The percentage of uneducated people is very low. In over 4,200 public elementary schools and over 700 private schools almost 475,000 children are taught every year. For higher education, besides the University of Copenhagen, which is for both men and women, there are high schools, veterinary, agricultural and art schools, as well as a college of pharmacy and a Polytechnic Institution.

Literature and Art. The earliest literary contributions from Denmark were in Latin, the oldest books dating back to the second half of the twelfth century. The first really literary writings were ballads about heroes, love and historical events, which for centuries had been told and retold before being placed in writing.

The first Danish printing press was set up in 1490, and in 1550 Christian Pedersen printed a translation of the Bible in Danish, thereby doing for the Danish language what Luther did for the German. Although Hans Christian Andersen (1805-1875) is the only Danish writer who has gained a world-wide reputation, a number of others have contributed works whose beauty and strength are acknowledged by those who read and understand the language. Ludwig Holberg (1684-1754) is considered the founder of Danish literature and of the Danish drama. Johannes Ewald (1743-1781) is Denmark's greatest lyric poet, and the influence of the works of the poet and dramatist Adam Oehlenschlager (1779-1850) is felt to this day. Georg Brandes (1842-), critic and literary historian, has introduced into Danish thought and letters more modern European ideals and tendencies than any other man. Among other writers of the nineteenth century are Herman Bang (born 1858) and Edward Brandes (born 1847), the dramatist brother of Georg Brandes.

The greatest sculptor of Denmark was Bertel Thorwaldsen, or Thorvaldsen (1770-1844), the results of whose genius are displayed in the Thorwaldsen Museum at Copenhagen. Among later artists are the painters Marstrand, Carl Block and Otto Bache. Hartmann, Gode and Heiss are the chief Danish composers of music.

Cities. The chief cities of Denmark, with



THE EXCHANGE, COPENHAGEN

The commercial and monetary clearing house of the kingdom. It is one of Denmark's finest ornaments, and a monument to King Christian IV. The tower of the building represents four dragons with their tails twisted together.

populations of over 10,000, are the beautiful capital, Copenhagen, with nearly half a million people; Aarhuus, Odense, Aalborg, Horsens, Randers, Esbjerg, Vejle, Fredericia, Kolding, Helsingor and Svendborg. The most important of these are described under their titles in these volumes.

Government. Denmark is a constitutional monarchy, governed until June 5, 1915, under the constitution of June 5, 1849, with its revision of 1866. Agitation for constitutional reform commenced in 1913, and the adoption of the new constitution in 1915 reduced the political powers of landholders and extended full suffrage to women.

Executive power is vested in the king, who must be a member of the Evangelical Lutheran Church, and in a council of nine ministers. The right to make and amend laws rests with a Parliament or legislative body, called the *Rigsdag,* or *Diet,* acting with the sovereign. The Rigsdag is composed of two houses, the *Landsthing,* or Upper House, and the *Folkething,* or House of Commons. There are sixty-six members in the Landsthing, twelve nominated for life, the rest for terms of eight years. Every citizen over twenty-five years old and a legal resident of his district is eligible to the Landsthing. The Folkething consists of 114 members, elected by popular vote for a term of three years. According to the Constitution every 16,000 people may be represented in the Folkething by one member. Every citizen of good reputation and over twenty-five years old is eligible to membership.

All men and women who have reached their twenty-fifth year, who are not in receipt of public charity and who have lived for one year in the electoral district in which they are listed are allowed to vote.

Members of the Rigsdag receive payment of $2.68 a day, including Sundays and holidays, for the first six months of each session, which commences the first Monday in October, and $1.50 a day for each day thereafter. Free second-class passage on railways is given to them, and they may charge traveling expenses to and from Copenhagen at the beginning and end of the session.

The government must present all money bills first to the Folkething; in other respects the houses have equal powers. Every four years the Landsthing appoints from its membership four judges, who with others form the *Rigeret,* a tribunal which tries parliamentary impeachments. The nine ministers may speak in either house, but may vote only in the one in which they are members.

For the purpose of local government Denmark is divided into eighteen counties, or *amter,* each *amt* having a governor, or *amtmand.* The counties are divided into hundreds, or

herreder, and they in turn are divided into parishes. In the towns there is a mayor appointed by the government, the larger cities also having boards of aldermen. Copenhagen, the capital, has its own special form of government.

The percentage of crime in Denmark is very small, there being fewer than 900 prisoners in the penitentiaries.

History. The early inhabitants of the mainland of Denmark were those warlike Germans, the Cimbri. They were overcome by Angles, Saxons and Jutes, and when the latter tribes invaded England the Danes of the island of Zealand entered the Continent and by reason of their adventurous spirit soon made their presence felt throughout Europe. The tales of Vikings are many and interesting. From the eighth century Danish kings were heard of, but the first prominent one was Svend I (about 985). He was followed by his son, the great King Canute, who conquered England, and during those reigns the Danes were converted to Christianity.

After Canute's death in 1035 there was much internal dissension and loss of possessions, but from 1157 to 1241, under Valdemar I, Canute VI and Valdemar II, Danish conquests again extended Denmark's power into other lands. After that, again in the hands of weak rulers, the country lost power and prestige. Finally, however, from 1375 to 1412, under the rule of Margaret, daughter of Valdemar IV, the country was given a strong government, and by the Union of Kalmar in 1397, Denmark, Norway and Sweden were united under her sovereignty. She appointed her nephew Eric as her heir. He had none of her great qualities, however, and he undid much of her excellent work. Tired of misrule, in 1448 the Danes chose Christian I as king and he became the founder of the royal family of Oldenburg, which ruled until 1863, a period of 415 years. Christian was also chosen ruler of Schleswig and Holstein, and so kings of Denmark received recognition in the German parliament.

Christian II took the throne in 1513, but his tyranny resulted in the loss of Sweden, that country gaining its freedom under Gustavus Vasa (see GUSTAVUS); it was never again united to Denmark. The cruelties of Christian II cost him the throne in 1523, and his uncle Frederick I was chosen king, ruling for ten years. During the reign of his successor, Christian III, Protestantism was established. During the sixteenth century Denmark began to have a part in European affairs, and during the reign of Frederick II (1559-1588) it was the mistress of the northern seas. Christian IV (1588-1648), one of the most able rulers of Denmark, took part in the Thirty Years' War (which see).

Until 1660 choice of a king was by election, and so the power of the nobles grew while the peasants were oppressed; through the resulting internal unrest the power of Denmark weakened. In 1660, however, Frederick III succeeded in having the kingship declared hereditary in his family; the power of the nobility was lessened, and many improvements in administration were introduced. Not until the rule of Christian VII (1776-1808), however, was serfdom abolished.

Through its relations with Napoleon, Denmark became involved in war with Sweden, England, Russia and Prussia, thereby losing its fleet to England in 1807 and being forced in 1814 to cede Norway to Sweden. Soon trouble started with Denmark's German subjects in Holstein and Schleswig. Rebellion and discontent were put down and held in check for a number of years, but finally Prussia and Austria determined to unite in settling the Schleswig-Holstein matter, and in 1864 war was begun in Denmark. As a result, Schleswig-Holstein passed to Prussia, but after the War of the Nations Schleswig returned to Denmark.

Of late years, one of the most important events in Danish history has been the necessity of granting a constitutional government to Iceland, and in 1904 a special minister for Iceland was created, to reside at Reykjavik. Through the marriage of children of Christian IX into many reigning families of Europe, during the latter half of the nineteenth century Denmark came into very close relationship with many European powers; during his later years Christian IX was called the "father-in-law of Europe." At his death in 1906 his son Frederick VIII succeeded him. For six years the latter was a democratic and popular ruler; his sudden death raised his son to the throne as Christian X.

Other Items of Interest. Denmark raises more wheat to the acre than any other country in the world.

Rates on the government-owned railroads of Denmark are astonishingly low, and if, at times, the trains are distressingly slow, this is compensated for in a measure by a total absence of accidents.

Conditions in Denmark may be summed up

OUTLINE AND QUESTIONS ON DENMARK

Outline

I. Location and Character

(1) Relation to other countries
(2) Neighboring bodies of water
(3) Peninsula of Jutland
(4) Islands
(5) Size

II. Physical Features

(1) Baltic plain
  (a) A sandy, wind-built country
(2) Fiords
(3) Heights of land
(4) Denmark's only river
(5) Forest area
(6) Climate

III. The People

(1) Physical and mental characteristics
(2) Language
(3) Literature
(4) Art
(5) Religion
(6) Education

IV. Industries

(1) Predominance of agriculture
  (a) Products
  (b) Coöperative methods
(2) Manufacturing
(3) Fishing

V. Transportation and Commerce

(1) Railways and navigable waterways
(2) Coastwise trade
(3) Articles of export and import

VI. Government and Colonies

(1) Constitutional monarchy
(2) The legislative branch
(3) Local government
(4) Important colonial possessions
  (a) Iceland
  (b) Greenland
  (c) Danish West Indies

VII. History

(1) The Viking era
(2) Canute the Great
(3) The Union of Kalmar
(4) Medieval struggles
(5) Early modern period
(6) Napoleonic era
(7) Recent prosperity

Questions

What part has the wind had in the building of this country?

What is the railway mileage for each hundred square miles of area? For each thousand inhabitants?

What has been the attitude in Denmark toward woman's suffrage?

What did the activities of the country during the Napoleonic wars cost it?

What has Denmark long possessed which the United States desired?

How many metals are produced on the peninsula and islands?

Which city of Denmark figured in one of the most famous literary works ever produced?

What relation does the country bear to the largest island in the world?

Why have manufactures developed so slowly? How are some of them still carried on?

What world-famous sculptor has the country produced?

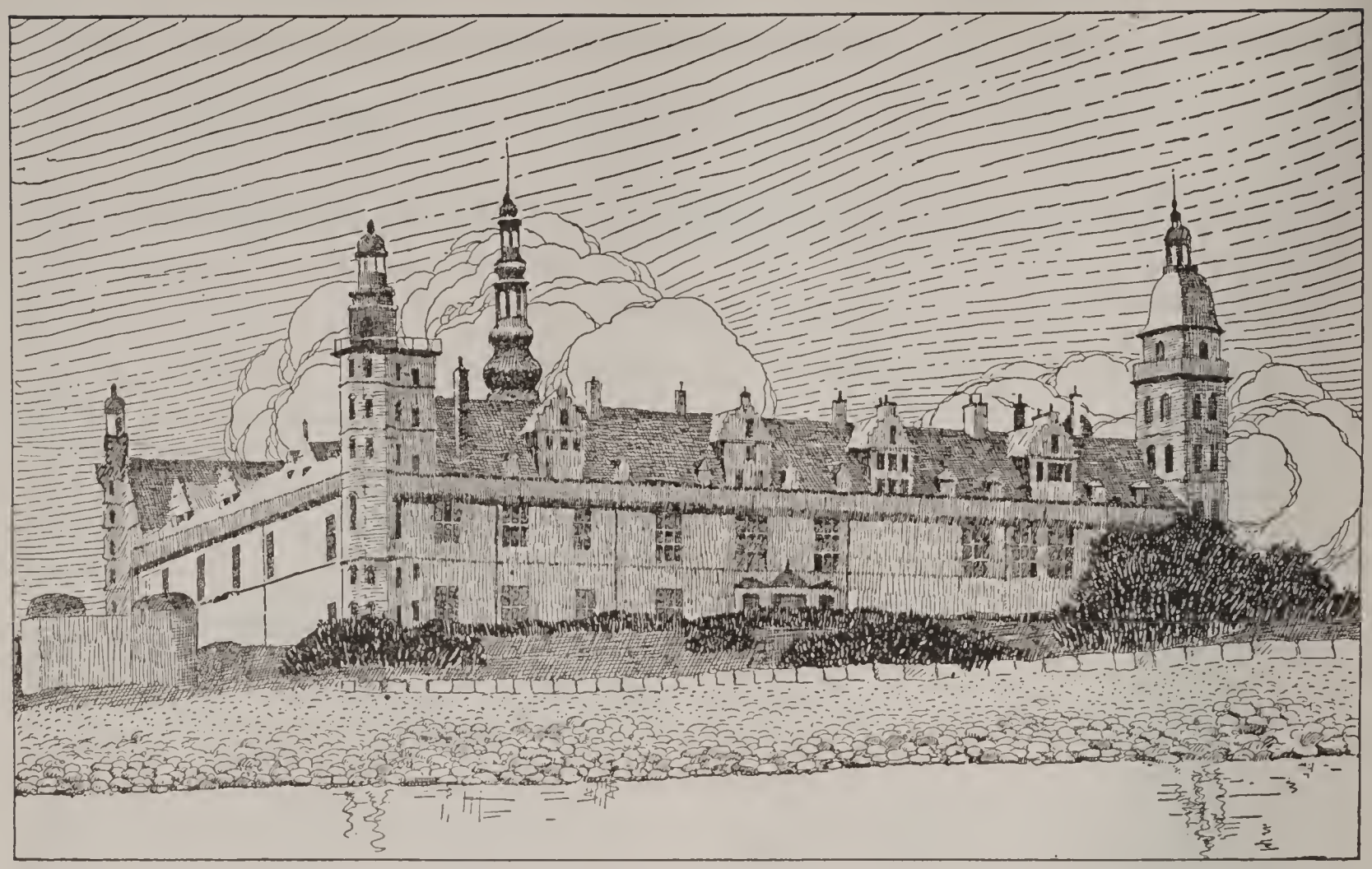
When, besides in the Viking era, was Denmark a "mistress of the seas"?

Which is the most thickly settled of Denmark's colonial possessions?

What principle have Danish farmers introduced which has made possible remarkable agricultural development?

What famous writer made the world familiar with many picturesque phases of Danish life?

Who was Denmark's great queen and what did she accomplish?



KRONBORG CASTLE, SCENE OF THE TRAGEDY OF HAMLET

Here, or it may have been in the grounds of the predecessor of this castle of the Middle Ages, occurred the scenes immortalized in Shakespeare's tragedy of *Hamlet*. The castle is on the little island of Elsinore, off the northern coast of Denmark, and within sight of the shores of Sweden. In the stormy times of long ago it was both a fortress and residence of the Vikings, and within its walls is the tomb of Holger Danska, the founder of Denmark. The story of Hamlet came out of the dawn of the thirteenth century, and although Ophelia's name did not appear in the early version, yet tradition has fixed upon the sequestered spot in the castle ground where she was buried. The scenes of the tragedy and the grave of Hamlet are pointed out to tourists.

in the saying that "Few have too little, still fewer too much."

A tiny headland off an island in the Liimfiord is looked upon by careful authorities as the possible burial place of Hamlet, though residents of Copenhagen insist that he is buried at Helsingör, or Elsinore, in their neighborhood. A traveler tells that he asked a Dane at Helsingör where Hamlet's grave was to be found, and was told that it was never built up until early spring, so that it might be fresh for the American and English tourists to chip up and carry away as souvenirs.

Denmark has 66.2 per cent of its land under cultivation, as against 15.4 per cent in the United States and .8 per cent in Canada.

Each year the United States imports hundreds of thousands of dollars' worth of pebbles for grinding ore and minerals, and the best of these pebbles come from Denmark. In recent years, too, the largest importation has been from that country.

Coöperative dairying and farming have worked wonders for the agricultural class in Denmark. Through this system the peasant farmer, with his few acres and three or four cows, is assured a market as positively as is the owner of large interests, and anything like a monopoly is made impossible.

Practically all the Danish farmers to-day own the land which they farm, whereas at the beginning of the nineteenth century most of them were serfs. Nothing illustrates better than this the progressive character of the people.

The cottage in which Hans Christian Andersen was born and spent his early youth is still to be seen in Odense.

Consult Harvey and Reppien's *Denmark and the Danes;* Thomas's *Denmark, Past and Present.*

Related Subjects. The following articles in these volumes will add to the general information on Denmark given above:

CITIES AND TOWNS

Aarhuus
Copenhagen
Odense

HISTORY

Canute
Christian
Cimbri
Frederick VIII
Hamlet
Northmen
Schleswig-Holstein

ISLANDS

Faroe
Greenland
Iceland
Saint Thomas
West Indies, Danish
Zealand

PRODUCTS AND INDUSTRIES

Agriculture
Butter
Dairying
Egg
Wheat

UNCLASSIFIED

Andersen, Hans Christian
Brandes, Georg
Coöperation
Fiord
Jutland
Thorwaldsen, Bertel

DENOM'INATE NUMBERS. There are standard units of measure used in industrial, commercial and scientific life. These units are tabulated in groups which are called the *tables of denominate numbers.*

Any number of the units of measure is called a *denominate number;* for example, 7 feet, 4 dollars, 17 gallons. A denominate number which is expressed in terms of two or more units of the same kind is called a compound denominate number; as, 3 pounds, 5 ounces; 4 feet, 6 inches.

Tables of Money. The following tables show the values of various important money units:

Table of United States Money

10 mills = 1 cent (ct.)
10 cents = 1 dime (d.)
10 dimes = 1 dollar ($)
10 dollars = 1 eagle

The dollar is the standard of value in the United States, and is divided into tenths (dimes), hundredths (cents), thousandths (mills).

Table of English Money

4 farthings = 1 penny (d.)
12 pence = 1 shilling (s.)
20 shillings = 1 pound (£)
21 shillings = 1 guinea

The old English penny corresponded to a coin used on the European continent, called *denarius,* hence the abbreviation "d" for penny. The penny equals about two cents. The pound sterling was, in the seventh century, a pound Troy in silver, hence its name. To-day its weight would be about one-third of its old weight, but there is no coin of that denomination now.

Table of Equivalent Values

COUNTRY	STANDARD	EQUIVALENT IN U. S. MONEY
United States	Dollar	$1
Great Britain	Pound (Sterling)	4.8665
France	Franc	0.193
Germany	Mark	0.238
Austria-Hungary	Crown	0.203
Italy	Lira	0.193
Greece	Drachma	0.193
Spain	Peseta	0.193
Russia	Ruble	0.772

We think ordinarily of a pound (£) as $5; a franc, a lira, a drachma, a peseta as $.20; a mark, a shilling as $.25.

1 franc = 100 centimes (c.)
1 mark = 100 pfennigs (pfs.)
1 ruble = 100 copecs (c.)
1 crown = 100 heller
1 lira = 100 centesimi

Tables of Length, Surface and Volume. Below are several important tables giving values of units used in measuring distances, surfaces, etc. In measuring distance or length, the standard unit is the yard, and the table is called the *Table of Linear Measure:*

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5½ yards = 1 rod (rd.)
16½ feet = 1 rod
320 rods = 1 mile (mi.)
5280 feet = 1 mile

The student taking up this subject should do much measuring inside and out-of-doors, getting real knowledge of the measures, not mere words. The home can be of much help to the school here because of the freedom possible in the house, yard, farm, etc. The school should ask for returns from measurements made at home.

From the linear table follows the table of square or surface measure; this is derived by building a square in each linear unit from inch through to rod.

Table of Common Surface Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)

The illustration at the right (Fig. 1) represents a square built on an inch; that is, one square inch. It is clear that a square built on ½ inch is ¼ of a square inch.

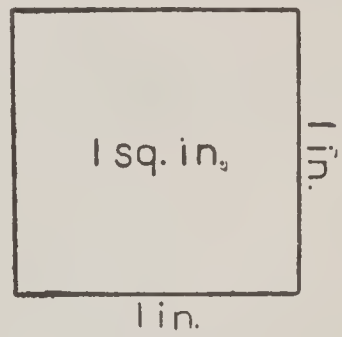


FIG. 1

The following (Fig. 2) represents a square built on a foot, divided into inches; that is, a square foot divided into square inches.

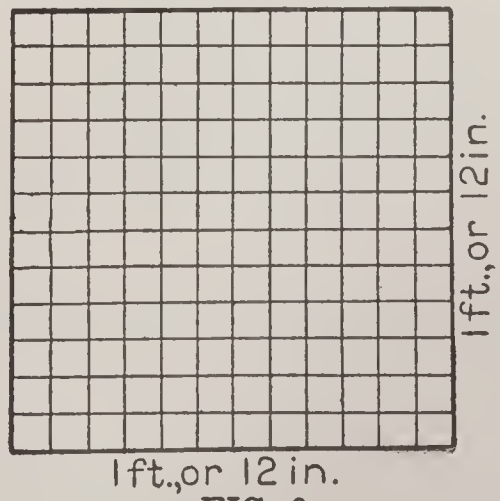


FIG. 2

Fig. 3 represents a square built on one yard; that is, a square yard, or nine square feet.

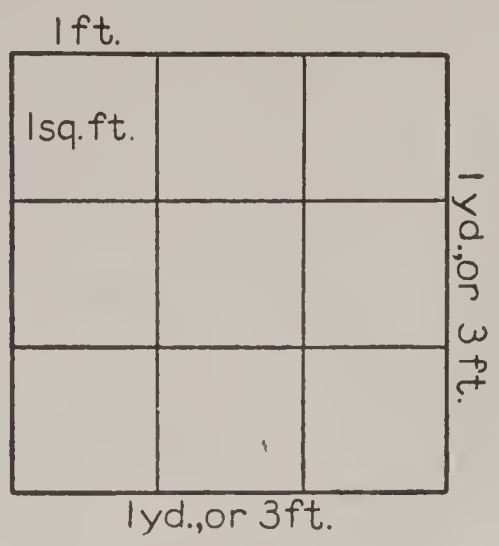


FIG. 3

Table of Surveyor's Linear Measure

7.92 inches = 1 link (li.)
100 links = 1 chain (ch.)
80 chains = 1 mile (mi.)

Surveyor's Surface Measure

625 square links (sq. li.)	= 1 square rod (sq. rd.)
16 square rods	= 1 square chain (sq. ch.)
10 square chains	= 1 acre (A.)
640 acres (a section)	= 1 square mile (sq. mi.)
36 square miles	= 1 township (Tp.)

The acre is not a square unit of measure as the square inch, square foot and so on; the name *acre* has been applied to a definite amount of ground, namely, 160 square rods, regardless of the shape of the piece of ground. An acre may be 16 rods long and 10 rods wide, or 8 rods by 20 rods, etc., as shown below (Fig. 4).

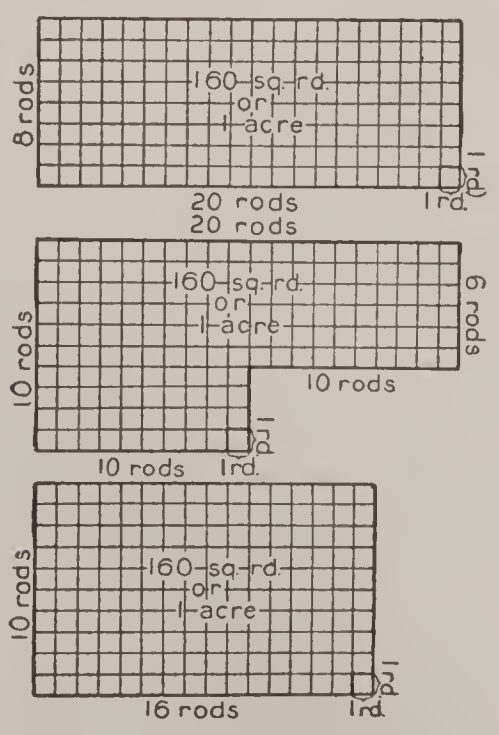


FIG. 4

Notice that there is no linear measure corresponding to acre.

Table of Cubic Measure

1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.)
27 cubic feet	= 1 cubic yard (cu. yd.)

How many cubic-inch blocks can be laid on one square foot of surface? (See Fig. 5.) Count and see. The number is 144. How

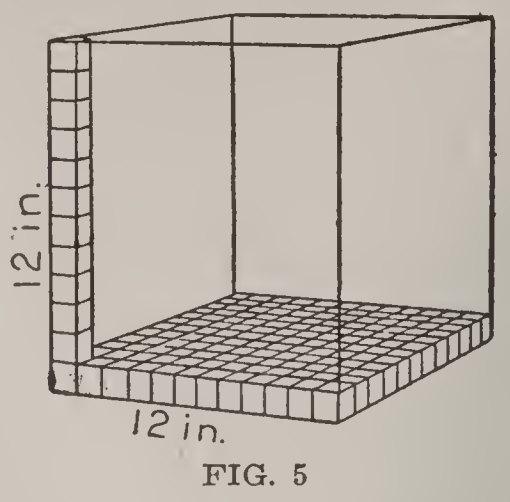


FIG. 5

many layers, each containing 144 cubic-inch blocks, can be piled up in a pile 12 inches high? How many cubic inches in a cubic foot?

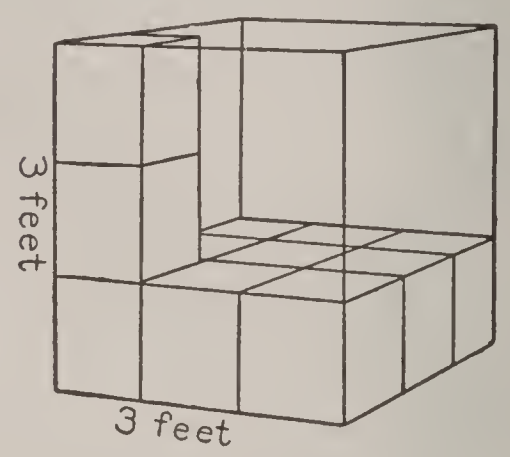


FIG. 6

Examine Fig. 6. How many cubic-foot blocks in the first layer? How many layers in the cubic yard? How many cubic feet in a cubic yard?

Cubic Measures Used in Industries

1 cubic yard	= 1 load
128 cubic feet	= 1 cord
24¾ cubic feet	= 1 perch

One load is the unit of measure for earth removed in excavating. One cord is the unit used in measuring fire wood; a pile of this wood 8 feet by 4 feet by 4 feet is called a *cord*. One cord foot is a pile 1 foot by 4 feet by 4 feet. One perch is the unit used in measuring stone; it is 1 foot by 1½ feet by 16½ feet, or contains 24¾ cubic feet.

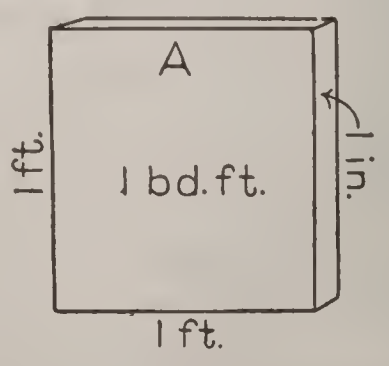


FIG. 7

Board Measure. One board foot is generally the unit of measure for lumber, boards, tim-

bers, joists, etc. The board foot is 1 foot long, 1 foot wide and 1 inch thick (see Fig. 7).

When lumber is less than one inch thick it is counted as one inch thick. If it is over one inch thick, the thickness is considered.

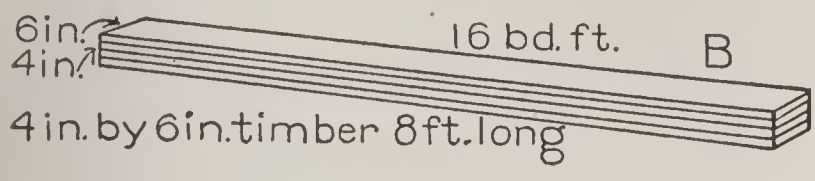


FIG. 8

The above timber (Fig. 8) contains 4 layers each 1 inch thick, with a surface 8 feet by 6 inches. Each layer contains 4 board feet; the timber contains 16 board feet.

A timber is 18 feet long, 8 inches wide and 6 inches thick. How many board feet in it?

Number of board feet=

$$\frac{(18\times\cancel{12})\times\cancel{8}\times\cancel{6}}{\cancel{144}\ \cancel{12}\ \cancel{2}\ 1}=72 \text{ or } 18\times\frac{2}{\cancel{3}}\times\cancel{6}=72.$$

Table of Liquid Measure

4	gills (gi.)	= 1 pint (pt.)
2	pints	= 1 quart (qt.)
4	quarts	= 1 gallon (gal.)
31½	gallons	= 1 barrel (bbl.)

One liquid gallon occupies 231 cubic inches. One cubic foot holds, roughly, 7½ gallons (Fig. 9).

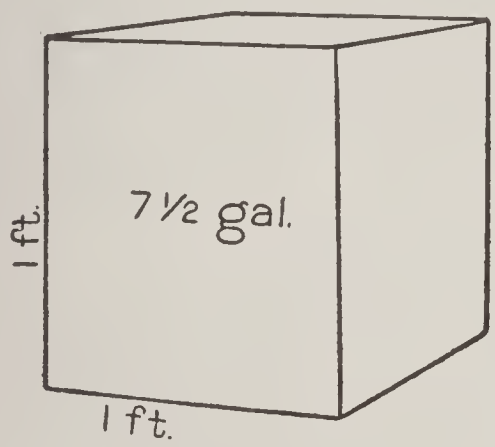


FIG. 9

Table of Dry Measure

2	pints	= 1 quart
8	quarts	= 1 peck
4	pecks	= 1 bushel

The standard of dry measure is the Winchester bushel, a cylinder 18½ inches in diameter and 8 inches deep, whose capacity is 2150.42 cubic inches. A bushel occupies, roughly, 1¼ cubic feet. Fruits and vegetables are now bought and sold largely by weight instead of dry measure.

Tables of Weight Measures. Below are given the tables in common use for the purpose of measuring weights.

Table of Troy Weight

24	grains (gr.)	= 1 pennyweight (pwt. or dwt.)
20	pennyweights	= 1 ounce (oz.)
12	ounces	= 1 pound (lb.)
1	pound Troy	= 5760 grains

Table of Avoirdupois Weight

16	ounces (oz.)	= 1 pound (lb)
100	pounds	= 1 hundredweight (cwt.)
2000	pounds	= 1 ton (T.)
2240	pounds	= 1 long ton (L. T.)
1	pound avoirdupois	= 7000 grains

Table of Apothecaries' Weight

20	grains (gr.)	= 1 scruple (℈)
3	scruples	= 1 dram (ʒ)
8	drams	= 1 ounce (℥)
12	ounces	= 1 pound (lb.)

Troy weight is used for weighing gold, silver, platinum, jewels; avoirdupois is used to weigh provisions, as meat, sugar and flour; farm products, as hay, butter, sugar beets, etc.; coal and iron and other commodities. Its name *avoirdupois* (*to have weight*) signifies its use in weighing bulky articles.

The Apothecaries' Table is used by the physician and the druggist. The grain is the unit of comparison among the three tables, being the same in all, while the avoirdupois pound (7000 grains) differs from the Troy and the apothecaries' pound, each of which is 5760 grains. The *grain* which was taken as the unit of the English system of weights was the average of grains "taken from the middle of the ear of wheat and well-dried." The Troy pound is the standard weight in the United States.

Other Tables. The following tables contain several interesting and important units that are made use of every day:

Table for Measuring Paper

24 sheets	= 1 quire	2 reams	= 1 bundle
20 quires	= 1 ream	5 bundles	= 1 bale

(Five hundred sheets are now commonly called a ream.)

Table for Counting

12	things	= 1 dozen (doz.)
12	dozen	= 1 gross
12	gross	= 1 great gross
20	things	= 1 score

Table for Time Measure

60	seconds (sec.)	= 1 minute (min.)
60	minutes	= 1 hour (hr.)
24	hours	= 1 day (da.)
7	days	= 1 week (wk.)
30	days	= 1 calendar month (mo.)
12	calendar months	= 1 calendar year (yr.)
365	days	= 1 common year
366	days	= 1 leap year
100	years	= 1 century

A mean solar day is the standard unit for measuring time; it is the interval of time from

noon of one day to noon of the next, at a given place, *noon* meaning the moment of the sun's crossing the meridian of that place. The mean solar year is 365 days, 5 hours, 48 minutes, 46 seconds, or nearly 365¼ days. The common year contains 365 days; leap year, 366 days. This is explained fully in the article CALENDAR.

Angular Measurement. In the measurement of angles the most important unit employed is the degree.

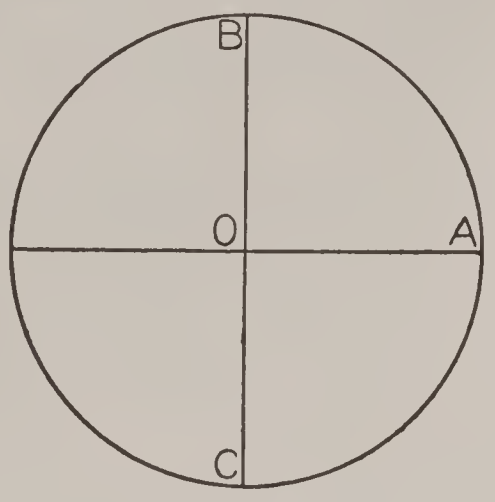


FIG. 10

In Fig. 10 the line OA is perpendicular to the line CB, and the angle AOB is a right angle. This angle is measured by the arc AB, or one-fourth of a circumference, and since every circumference is divided into 360 degrees (360°), it is an angle of 90°. Any angle less than a right angle is measured by less than one-fourth of a circumference, and so is less than 90°. Any angle greater than a right angle is measured by more than one-fourth of a circumference and is more than 90°, as seen below (Fig. 11).

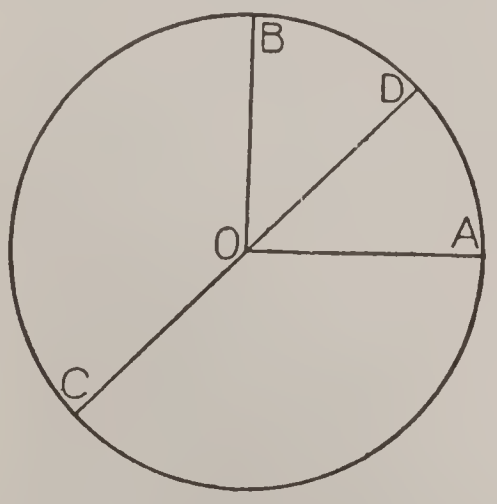


FIG. 11

The angle AOD is an angle of 45°, and AOC is an angle of 135°.

Table of Angular Measure

60 seconds (″) = 1 minute (′)
60 minutes = 1 degree (°)
360 degrees = 4 right angles or 1 circumference

Reduction of Denominate Numbers. The process of reducing denominate numbers to lower denominations or units is called *reduction descending;* as, 6 feet=72 inches. The process of reducing them to higher denominations or units is called *reduction ascending;* as, 16 pints =8 quarts. The latter reduction is used the more often.

Reducing to a lower unit. (1) Express 16 ft. in inches:

Number of inches = 16 × 12 = 192
or
16 ft. = 16 × 12 in. = 192 in.

(2) Change 9 ft. 8 in. to inches.

Number of inches = (9 × 12) + 8 = 116.

(3) Express in ounces avoirdupois 7 lb. 8 oz.

Number of ounces = (7 × 16) + 8 = 120.

(4) Express as square inches: 9 sq. ft. 123 sq. in.

Number sq. in. = (9 × 144) + 123 = 1419
or
9 sq. ft. + 123 sq. in. = (9 × 144) sq. in. + 123 sq. in. or 1419 sq. in.

The work is done without names thus:

```
 144
 ×9
----
1296
+123
----
1419
```

The most desirable form for such problems is that in which the words are at the left-hand side of the equality sign and no words are attached to numbers, as:

Number of sq. in. = (9 × 144) + 123 = 1419.

(5) Express as seconds, 3 da. 7 hr. 50 min. 8 sec.

Number hr. = (3 × 24) + 7 = 79.
Number min. = (79 × 60) + 50 = 4790.
Number sec. = (4790 × 60) + 8 = 287408.

The work done without names is as follows:

```
 24          79          4790
 ×3          ×60         ×60
----        ----        -----
 72         4740        287400
 +7          +50           +8
----        ----        -----
 79         4790        287408
```

Reducing to higher units. (1) Change to feet (a) 216 in.; (b) 7 ft. 9 in.

(a) Number ft. = $\frac{216}{12}$ = 18. (b) Number ft. = $7\frac{9}{12} = 7\frac{3}{4}$.

(2) Change to pounds avoirdupois (a) 432 oz.; (b) 7 lb. 15 oz.

(a) Number lb. = $\frac{432}{16}$ = 27. (b) Number lb. = $7\frac{15}{16}$.

(3) Change to higher units 5963 pints.

$$\text{Number qt.} = \frac{5963}{2} = 2981, \text{ and 1 pt.}$$

$$\text{Number pk.} = \frac{2981}{8} = 372, \text{ and 5 qt.}$$

$$\text{Number bu.} = \frac{372}{4} = 93.$$

5963 pt. = 93 bu. 5 qt. 1 pt.

It may be done in this concise form:

2|5963
8|2981 + remainder 1
4|372 + remainder 5
93

5963 pt. = 93 bu. 5 qt. 1 pt.

(4) Change 56 cwt. to T.

$$\text{Number T.} = \frac{56 \times 100}{2000} = 2\frac{4}{5}$$

(5) Express in bu. 3 pk. 5 qt. 1 pt.

$$\text{Number qt.} = 5\frac{1}{2}$$

$$\text{Number pk.} = 3\frac{5\frac{1}{2}}{8} = 3\frac{11}{16}$$

$$\text{Number bu.} = \frac{3\frac{11}{16}}{4} = \frac{59}{64}$$

Note—1 pt. = ½ qt., so there are 5½ qt.; it requires 8 qt. to make a pk.; 5½ qt. = $\frac{5\frac{1}{2}}{8}$ of a pk.; multiply numerator and denominator of the complex fraction by 2, thus; $\frac{5\frac{1}{2} \times 2}{8 \times 2} = \frac{11}{16}$. There are 3 pk. and 11/16 pk. or 3 11/16 pk., which is $\frac{3\frac{11}{16}}{4}$ of a bu. Reduce fraction by multiplying both terms by 16, thus; $\frac{3\frac{11}{16} \times 16}{4 \times 16} = \frac{59}{64}$.

Addition and Subtraction of Compound Denominate Numbers. In the following paragraphs the principles underlying the addition and subtraction of denominate numbers are explained. *Addition:*

Add:	8 gal.	3 qt.	1 pt.
	1 gal.	2 qt.	3 pt.
Sum:	9 gal.	5 qt.	4 pt.
Reduced sum:	10 gal.	3 qt.	0 pt.

Add at first; then reduce:

4 pt. = 2 qt.
(5+2) qt. = 7 qt. = 1 gal. 3 qt.
9 gal. + 1 gal. = 10 gal.

Reduce as you add, as below:

sq. yd.	sq. ft.	sq. in.
6	4	20
2	8	200
9	4	76

Note—Out of 220 sq. in. we get 1 sq. ft. (which is 144 sq. in.), and have left 76 sq. in.; (4+8+1) sq. ft. = 13 sq. ft.; out of 13 sq. ft. we get 1 sq. yd. (which is 9 sq. ft.) and have left 4 sq. ft.; (6+2+1) sq. yd. = 9 sq. yd.

Add:

	mo.	da.	hr.	min.
	4	12	18	40
	3	15	12	50
	1	20	25	52
Sum:	8	47	55	142
Reduced sum:	9	19	9	22

(1) Add each set.

(2) Divide 142 by 60 (the number of minutes in an hour), which gives 2 and a remainder 22. This means that 142 minutes = 2 hours and 22 minutes.

(3) Add 2 to 55 and divide 57 by 24 (the number of hours in a day); this division shows there are 2 days and 9 hours in 57 hours.

(4) Add 2 to 47, and divide 49 by 30 (the number of days in 1 month); this division shows there are 1 month and 19 days in 49 days.

(5) Add 1 to 8.

We find the sum to be 9 months 19 days 9 hours 22 minutes. Reduce each set as we go along and get the final answer at once, as below:

gal.	qt.	pt.	gi.
4	3	1	3
1	2	1	2
2	1	1	1
9	0	0	2

Adding the gills we get 6 gills, which equals 1 pint 2 gills. Place 2 gills in gills' place, add 1 pint to the pints, and get 4 pints, which equal 2 quarts and no pints. Add the 2 quarts to the quarts and get 8 quarts, which equal 2 gallons. Add the 2 gallons to the gallons and have 9 gallons. The answer is 9 gallons 0 quarts 0 pints 2 gills.

Subtraction:

(1) A boy weighed on Monday 118 lb. and 7 oz.; on Thursday 116 lb. and 13 oz. What did he lose in the time?

lb.	oz.	lb.	oz.
118	7 =	117	(16+7) = 23
116	13 =	116	13
		1	10

Note—We cannot take 13 oz. from 7 oz., so we take 1 lb. from 118 lb. and add it (16 oz.) to 7 oz. and have 23 oz. Subtracting, we have 1 lb. 10 oz.

(2) From a piece of ground containing 78 acres and 90 sq. rd., a piece is sold containing 15 acres and 140 sq. rd. What is left?

acres	sq. rd.	acres	sq. rd.
78	90 =	77	250 (160+90)
15	140 =	15	140
		62	110

(3) Subtract the following:

gal.	qt.	pt.	gi.
6	2	1	1
4	3	1	3
1	2	1	2

Note—Change 1 pt. to 4 gi.; then subtract 3 gi. from 5 gi. and have 2 gi. left. Change 1 qt. to 2 pt. and subtract 1 pt., having 1 pt. left; then change 1 gal. to 4 qt. and add that to 1 qt.; from the sum take 3 qt., leaving 2 qt.; finally take 4 gal. from 5 gal. and have 1 gal. left.

Multiplication:

The average weight of the girls in a class of 25 is 86 lb. 9 oz. What do they all weigh?

lb.	oz.
86	9
	25
2150 lb.	225 oz.=2164 lb. 1 oz.

Multiply 9 ounces by 25 and get 225 ounces; multiply 86 pounds by 25 and get 2150 pounds. Change 225 ounces to pounds by dividing 225 by 16 (the number of ounces in a pound). Find 225 ounces=14 pounds and 1 ounce, and note that the answer becomes 2164 pounds and 1 ounce.

Division:

yr.	mo.	da.
6|3	8	20
	7 mo.	13⅓ da.

Note—3 yr.=36 mo. 36 mo.+8 mo.=44 mo. 44÷6=7 and a remainder of 2. 2 mo.=60 da. 60 da.+20 da.=80 da. 80÷6=13⅓. The answer is 7 mo. and 13⅓ da.

lb.	oz.	lb.	oz. (avoirdupois)
240	12÷	26	12

This division we may carry out in three ways, as follows:

(a) Reduce dividend and divisor to ounces, and divide, as follows:

lb.	oz.	lb.	oz.
240	12÷	26	12=
	oz.	oz.	
	3852÷	428	=9

(b) Reduce both terms to pounds and divide, as follows:

lb.	oz.	lb.	oz.
240	12÷	26	12=
lb.	lb.		

$$240\tfrac{3}{4} \div 26\tfrac{3}{4} = \frac{963}{4} \div \frac{107}{4} = 9$$

(c) Divide as the problem reads, as follows:

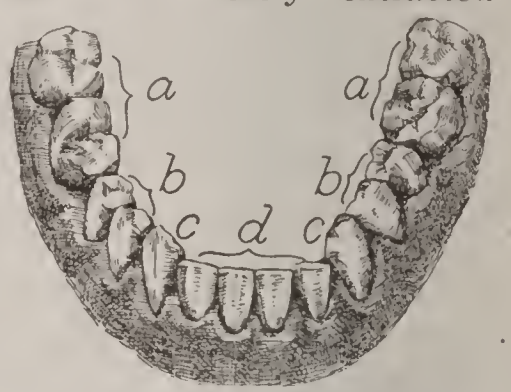
		9	
lb.	oz.	lb.	oz.
26	12	240	12
		240	12

9×12 oz.=108 oz., which equal 6 lb. and 12 oz.
9×26 lb.=234 lb.
234 lb.+6 lb.=240 lb. A.H.

DENT, John Charles (1841-1887), a Canadian historian whose books are noteworthy for their clear, forceful style and their frank analysis of political history. Dent was of English birth, but when still a child was taken to Ontario by his parents, and was educated in the public schools. He was called to the bar in 1865, but spent most of the next ten years in newspaper work, first in London, England, then in Boston, and lastly in Toronto. Thereafter he devoted himself to historical investigation, his chief works being *The Canadian Portrait Gallery,* a series of biographical sketches; *The Last Forty Years,* a history of Canada between 1841 and 1881; and *The Story of the Upper Canada Rebellion.* Though occasionally marred by prejudices, these volumes in the main are the works of an impartial, conscientious investigator who stated his honest conclusions, and they marked a great advance in Canadian historical writing.

DENTISTRY, *den'tis tri,* that branch of medical science which deals with the teeth and surrounding tissues, and their preservation. The progress made in methods and practice of dentistry has been most marked during comparatively-recent years. For ordinary practical purposes dentistry may be divided into two distinct branches, namely, *surgical,* or operative, and *mechanical,* or prosthetic.

Surgical Dentistry. This branch consists in diagnosing the symptoms shown by the patient's mouth and teeth and in giving required treatment. In grandfather's time a dentist was a man who merely extracted teeth. That conception has been entirely altered, and extraction is now resorted to only in cases of absolute necessity, as for instance, when teeth have been so neglected that treatment would be of no benefit. Modern dentistry demands the saving treatment of teeth. If teeth are naturally overcrowded or irregularly arranged in the mouth, the dental surgeon will endeavor to overcome those defects. If a tooth aches, it is not necessarily an indication that it must be taken out. Careful treatment will relieve the ache caused by the cavity in the tooth, and the cavity will be filled. If the decay has exposed the nerve or the pulp of the tooth, the nerve can be removed and the root canal filled, making it possible to fill the cavity later. Scaling, or the careful removal of tartar accumulated at the base of the teeth, is another important feature, adding to the life of the teeth.



THE ADULT TEETH
(*a*) Molars; (*b*) bicuspids; (*c*) canines; (*d*) incisors.

Preventive Dentistry in Schools. It was long the notion that the state of a child's first teeth was not important; they must drop out anyway, so why trouble about them? But in recent years there has come increased knowledge of the harm which neglected teeth may cause, and as a result preventive dentistry is

being much practiced in connection with the schools. In some cities dentists are paid from the city funds and are thus enabled to devote a large part of their time to correcting the defects in children's teeth, and to instructing them how to care for their teeth, while in other places examinations only are made, and the parents are advised to have their children's teeth attended to. The theory that many a case of dullness in school is directly or indirectly due to bad teeth was scoffed at but a few years ago, but now it is commonly acknowledged. This is a day of prophylaxis, or preventive treatment. Caries, or decay of the teeth, is caused by a germ or organism that lives and reproduces its kind in the grooves and unclean areas of the teeth. It secretes an acid which dissolves the enamel and enters into the dentine, the soft and porous structure of which the tooth is largely made up. Once it starts, decay progresses rapidly. *Clean teeth do not decay.*

Mechanical Dentistry. This includes the branch which deals with making and inserting artificial teeth in place of natural teeth that have been extracted. Dental work of this character requires mechanical skill and careful observation of any peculiarities of the mouth, in order that the teeth inserted may not be unlike the natural teeth in color, size and shape. Artificial teeth are made of porcelain, and may be affixed to plates of vulcanized rubber or to plates of gold or platinum made to fit the gums. Teeth that have been badly broken by decay may be covered with gold and thus restored to usefulness. The practice of crowning teeth with gold is decreasing. A comparatively-recent process, showing a marked advance over older methods of inserting artificial teeth, is known as bridge work. The teeth are fixed by bands, springs or crowns to the natural teeth in the mouth, and last much longer than teeth inserted by any other method.

Painless Dentistry. This phrase once carried little consolation to a patient with aching, sensitive teeth, and was a favorite topic of humorous paragraphers. They intimated that it was painless to the dentist only, which was quite the truth. To-day, however, the dental profession, down to its most inconspicuous members, may actually practice almost painless dentistry.

An ingenious device contains nitrous oxide and oxygen in separate compartments, but when administered to the patient the two gases may be mixed in any proportion. When operative work is done on teeth more oxygen than nitrous oxide is inhaled; the result is absolute absence of pain, but all other senses than feeling are retained; in case of extraction of teeth less oxygen and an added quantity of other gas renders the patient unconscious, with subsequent recollection of only a delightful dream. No ill effects follow its administration; indeed, the presence of oxygen, a stimulating agency, assures the safety of the patient. Dentists are adopting this device rapidly and the dental chair is losing much of its old-time terror.

Another advance was recently made in the introduction into dental practice of what is known as *conductive anesthesia,* or nerve-blocking. This consists in injecting an anesthetic into a nerve controlling the affected tissues, as a result of which the patient ceases to have any sensation whatever in those particular tissues. The effect of the nerve-blocking sometimes lasts two hours, and the method has been found especially valuable in cases where the operation is delicate and tedious, as the extraction of an impacted wisdom tooth. It is also a welcome boon to patients who are high-strung.

Antiquity of Dentistry. It has often been stated that in the days of ancient Egypt it was customary to fill cavities in teeth with gold. Gold has been found in the teeth of mummies, according to some writers. That fact has never been fully established, but that dentistry was practiced in the days of the Pharaohs is undoubted. Many centuries before the Christian Era, gold crowns were worn, bridge work was not unknown, and single artificial teeth were inserted in the place of those newly extracted. Knowledge of the art, however, was lost, and its revival is a matter of modern history.

Dental Schools. For the purpose of giving instruction in dental surgery and mechanical dentistry, schools have been established in many large cities of the world. The first of these schools in America was founded in Baltimore in 1839. A few years later the Ohio College of Dental Surgery was established. Nearly all universities in the United States and Canada now have dental schools and confer degrees on graduated students. The course of study usually embraces four years, during part of which practical experience is gained. A high school course is necessary before admission to any dental school can be obtained. See TEETH.

W.F.L.

DENVER, Colo., popularly known as the *Queen City of the Plains,* the capital and metropolis of Colorado, the county seat of Denver County, and one of the largest cities between the Missouri River and the Pacific coast. It is north and east of the center of the state and is 1,457 miles east of San Francisco, 2,025 miles west of New York City, and 1,050 miles west of Chicago. In 1910 the population was 213,381; in 1920 the Fourteenth Census gave it 256.491. The area is fifty-eight square miles. Denver is an increasingly-popular summer resort, and it entertains 100,000 visitors annually. The city is on a plain about twelve miles east of the foothills of the Rocky Mountains; the altitude is exactly one mile above sea level. The scenery of the surrounding region is famed for its grandeur. For a distance of 200 miles, from north to south, extends a chain of snow-covered peaks visible from the city. Among these, Long's and Gray's peaks and many others have altitudes exceeding 14,000 feet. The mean annual temperature for July, the hottest month, is 72°, and for January, the coldest month, is 29°. The average annual rainfall is about fourteen inches, and the sun shines 275 days in the year.

The railroads entering Denver have been one of the chief factors in its growth and prosperity. In 1870 a branch line of the Union Pacific was constructed from Cheyenne to Denver, then a city of 4,759 inhabitants. It is now one of the most important railroad centers of the West and is entered by the Union Pacific; Burlington Route; Atchison, Topeka & Santa Fe; Chicago, Rock Island & Pacific; Colorado & Southern; Denver & Rio Grande; Denver, Laramie & Northwestern; Colorado Midland, and the Missouri Pacific railroads. Electric interurban lines extend to Boulder, Golden, Littleton and Aurora. Two small streams, the South Platte River and Cherry Creek, meet in the center of the city.

Parks. All of the parks, which have a combined area of more than 1,000 acres, offer splendid views of the mountains. Many of them contain small lakes; City Park (320 acres), the largest, has a lake, natural history museum, zoölogical garden, aviary and speedway. Washington, Cheesman and Berkeley parks are beautiful spots; Lakeside and Elich's Gardens are attractive amusement resorts. Speer Boulevard is a noteworthy part of an extensive system of drives extending throughout the city. A great number of mountain resorts are easily reached from Denver.

Public Buildings. The capitol, completed in 1895 at a cost of $2,800,000, is constructed of native granite and occupies a conspicuous position on a rise of ground known as Capitol Hill. Its most distinctive feature is a splendid gold-covered dome. Other prominent buildings include the United States Mint, which, with equipment, cost $1,225,000; the county courthouse; Chamber of Commerce; the Auditorium, with a seating capacity of 12,000; a public natatorium, costing $100,000; the old and new Federal buildings, the latter completed in 1916 at a cost of $2,000,000; East Denver High School, the Carnegie Library and the Union Depot. Saint John's Cathedral (Episcopal), the Cathedral of the Immaculate Conception and the Trinity Methodist Episcopal Church are handsome structures. The city has many fine banks, theaters and hotels.

Institutions. Denver is the seat of Denver University, under Methodist control (see Denver, University of). It has also the Jesuit College of the Sacred Heart, Westminster College (Presbyterian), Iliff School of Theology, Colorado Woman's College, Loretto Heights Academy, Miss Wolcott's School and a number of other private schools and schools of dramatic art, music and art. The libraries of the city include a fine public library with five branch organizations, the state library, supreme court library and those owned by the various schools.

The altitude and fine climate of Denver are particularly beneficial in the treatment of tuberculosis, and in the city are a number of splendidly-equipped sanatoriums. One of the best known is the Agnes Memorial Sanatorium.

Among the most important hospitals are Denver County, Saint Luke's and Saint Joseph's.

Industries. The annual output of the smelters of the city is valued at nearly $8,000,000. The smelting of lead, copper, iron, gold, silver, radium, uranium and other ores is one of the principal industries. There are extensive stockyards which annually handle about 1,500,000 head of stock. For the annual live stock show, which is next in size to that held in Chicago, a Stadium has been built of steel and concrete, at a cost of $250,000. There are large slaughtering and meat-packing plants, sugar beet factories, railroad construction and repair shops, foundries and machine shops, and over 1,090 manufacturing plants which have an annual output valued at $125,000,000. Mining machinery is an important manufactured product. The number of railroads entering the city and the great distance from places of competitive advantages make Denver the largest distributing point of the Rocky Mountain states.

History. Denver was settled by miners in 1852, and was named in honor of General J. W. Denver, governor of Kansas, of which state Colorado was then a part. The city was incorporated the following year by a provisional legislature and was reïncorporated by the first territorial legislature in 1861. It became the capital of the territory in 1867. The town of South Denver was annexed in 1894. H.C.T.

DENVER, UNIVERSITY OF, the oldest institution for higher education in the Rocky Mountain states. It was founded at Denver in 1864 by Governor John Evans, and for the first sixteen years was known as Colorado Seminary. In 1880, when a reorganization took place and the educational work was greatly broadened, the present name was adopted. On the campus at University Park are conducted the college of liberal arts, the graduate school, the summer school and Warren Academy. The professional schools of law, dentistry and commerce, and the teachers' college are located in the heart of the city. Among the buildings at University Park is the Chamberlain Observatory, one of the most important astronomical observatories in the world. The faculty numbers about 100; the student enrollment is over 1,800, and the university library contains nearly 40,000 volumes.

DEPARTMENT, one of the chief territorial and administrative divisions of France, corresponding in some measure to a state of the American Union, or to a province of Canada. When the kingdom was divided into departments at the time of the French Revolution the division was determined by the number of people, amount of direct taxes and extent of territory. This division was effected in 1789, the thirty-four provinces being replaced by eighty-three departments, which were subsequently increased by four after the close of the Franco-German War in 1871. Each department is subdivided into *arrondissements,* or congressional departments, for political purposes; these into *cantons,* or electoral districts; and the cantons into *communes,* or the smallest administrative districts. A *prefect,* appointed by the central government, presides over each department.

DEPART'MENT STORE. Although of comparatively recent development, the modern department store has proved one of the greatest successes of the times from an economical point of view. The creation of such stores was prompted by the unquestioned advantages a person could derive from being able to do all necessary purchasing under one roof instead of being obliged to make a tour of a number of stores.

The modern department store is equipped to meet the needs not only of individuals but of entire families. Not only are necessities such as food provided, but dry goods, clothing, millinery, furniture, hardware and a wide variety of other articles are all to be found, each in a special department which is in itself a complete store. It would be more difficult to mention an article in daily use that could not be obtained at a department store than to enumerate the vast number of things that are daily sold there.

The department store is generally supposed to be entirely an American development, but such is not the case. The same principles were adopted in London in 1863 by William Whiteley, who became known as the "Universal Provider." He added department after department to his original store until his business grew into one of the largest in England. However, the department store has reached its highest stage of efficiency, in organization and in service, in the United States and Canada. The opening of a large department store in one of the most fashionable streets of London in 1909 by a prominent Chicago business man was regarded as an event of great importance in the English business world. Undoubtedly the introduction of more up-to-date methods had a great influence on shopping in London. This influence was quickly seen

in the endeavors of old established conservative firms with few merchandise departments to bring themselves into a position to compete with the new methods. The finest and best-appointed department store in the United States is in Chicago; the most famous stores are in Philadelphia and New York. The best in Canada is in Toronto, and the most renowned in Europe is the Bon Marché in Paris.

Some Results of Department Stores. The opening of department stores called forth a storm of protest from firms in every branch of retail business, which suffered greatly from the innovation. Many small business men were deprived of their livelihood, as no matter what their particular line was, department stores dealt in it and could undersell small retail competitors. From the public point of view the department store might be regarded as an unmixed blessing, but its effects on business generally were often very hurtful. The centralization of merchandising enabled the department store operators to purchase cheaply and to offer big bargains to their customers, but their methods often prevented the small merchant from securing goods at reasonable prices. The result of the competition between department store and small retailer is that many of the latter have been forced into the wage-earning class, preferring to be employed rather than continue a hopeless fight. Most modern department stores are run in direct connection with a large number of factories which supply most goods that are required at the store. On account of quantities handled they can produce cheaply and supply to the customer better articles than the small retailer could obtain, and at lower prices. F.ST. A.

DE PAUW, *de paw',* **UNIVERSITY,** at Greencastle, Ind., was founded in 1837 by the Indiana Conference of the Methodist Episcopal Church. Until 1884 it was known as the Indiana Asbury University, but in that year the name was changed to De Pauw, in honor of Washington C. De Pauw, whose will provided the institution with a liberal endowment fund, which with other gifts from his family amounted to $600,000. The annual income from all sources is about $90,000. At the present time the university includes the college of liberal arts and a school of music. The faculty numbers over forty, the student body, about 1,000. There are 50,000 volumes in the university library.

DEPEW', Chauncey Mitchell (1834-), an American lawyer, orator and former United States Senator, born in Peekskill, N. Y. He was graduated from Yale College in 1856, immediately took up the study of law in Peekskill and New York City and was admitted to the bar in 1858. He was made attorney and director of the consolidated Hudson River and New York Central railroads in 1869, became general counsel for the Vanderbilt railroad system in 1875 and president of the New York Central Railroad in 1885. The degree of LL.D. was conferred upon him by Yale College the same year. In 1898 he was elected chairman of the board of directors of a number of the largest railroad corporations in the country.

After middle life he had an eventful political career. He figured prominently as a Republican Presidential candidate in 1888, but withdrew in favor of Benjamin Harrison, who after his election tendered Depew the portfolio of the Secretary of State, which he declined. From 1899 to 1911 he was United States Senator from New York. Depew enjoys world-wide fame as an orator, lecturer and after-dinner speaker, and has been sought in these capacities for many years. He has been twice married, first in 1871 to Elise Hegeman, who died in 1893, leaving one son. Miss May Palmer, many years younger than himself, became his wife in 1902.

DE QUINCEY, *de kwin'si,* Thomas (1785-1859), one of the foremost English essayists, whose most famous work, *The Confessions of an English Opium-Eater,* is unsurpassed as an example of imaginative, rhythmical prose. This is not only a masterpiece of autobiographical writing, but an important contribution to English literature, for it showed what possibilities exist in English prose when it is handled by a writer of extraordinary imaginative power.

THOMAS DE QUINCEY

De Quincey, the son of a wealthy merchant of Manchester, was left fatherless at the age of seven. He was sent to the grammar schools of Bath and Manchester, and at the latter institution was so unhappy that he ran away. After several months of adventure among the hills of Wales and in London, his family found him in a half-starved condition, and sent him

to Worcester College, Oxford. There he remained five years, but was too irregular in his studies to win a degree. During his college career he began to take opium in order to deaden the unbearable pains of neuralgia, and the habit never wholly relaxed its grip on him.

De Quincey left college in 1807, and the following year settled at Grasmere, in the Lake country, to enjoy the companionship of Wordsworth, Coleridge and Southey. In 1821, the year in which his *Confessions* appeared, he removed to London. Having begun to write for the famous Scottish periodical, *Blackwood's Magazine,* he settled in Edinburgh in 1828, and in or near this city resided for the rest of his life.

The greater part of De Quincey's work was published first in periodicals—*Blackwood's, Tait's* and the *London Magazine.* His *Murder Considered as One of the Fine Arts* is a striking example of grim humor; *On the Knocking at the Gate in Macbeth* and *Literary Reminiscences* represent his genius for sympathetic and imaginative criticism. Among other brilliant essays are *The Flight of a Tartar Tribe, Joan of Arc* and *The English Mail Coach.*

DERBY, *der'bi,* a manufacturing town, capital of Derbyshire, in England. It is situated in the beautiful and fertile valley of the Derwent River, 129 miles northwest of London and forty miles northeast of Birmingham. Its position renders it well suited to maintain itself as a commercial center, as it is connected by river, canal and railroad with all parts of England. The city owns all public utilities, which are economically and efficiently worked. The principal manufactures are porcelain, lace, silk and cotton goods. The works of the Midland Railway Company give employment to over 12,000 of the inhabitants. Derby possesses one of the oldest free grammar schools in England, dating from the year 1160. On the opposite side of the Derwent was situated the old Roman village of Derventio. Here many interesting Roman relics, including coins of brass, silver and gold, have been found. In 1745 the Young Pretender, Charles Edward, reached Derby in his attempt to seize the English throne. Population in 1911, 123,433.

DERBY, Conn., a city in New Haven County, in the southwestern part of the state, ten miles west of New Haven. It is on the Housatonic River, at the mouth of the Naugatuck, and on the New York, New Haven & Hartford Railroad and interurban electric lines. The population in 1910 was 8,991; in 1920 it was 11,238. The area of the city is nearly six square miles. Derby and the neighboring towns of Shelton and Ansonia form one of the most important manufacturing centers in the state. The principal manufactures are machinery, brass, iron, paper, guns and ammunition, typewriters, pianos and piano-players, woolen underwear, hosiery, corsets and pins.

Near Derby are Sentinel Hill, Lake Housatonic and Housatonic Dam, which is twenty-five feet high and a quarter of a mile in length. The city has the Griffin Memorial Hospital, a municipal opera house and two public libraries. Settled about 1646 and known as Paugassett until 1675, Derby was then incorporated under its present name, Ansonia being originally a part of it. In 1893 the town of Derby and the borough of Birmingham, connected by a bridge across the Naugatuck River, were organized as a city.

DERBY, Frederick Arthur Stanley, Sixteenth Earl of (1841-1908), a British statesman and colonial administrator, perhaps better known as Baron Stanley of Preston, the title he bore during the years he was Governor-General of Canada. The Stanleys are a family which has been conspicuous in public affairs since the reign of King Henry VII. Edward Stanley, the fourteenth earl (1799-1869), the "Rupert of debate," was a brilliant orator and was three times Prime Minister of Great Britain. His eldest son, Edward Henry Stanley, the fifteenth earl (1826-1893), was also a prominent statesman and was at one time seriously considered as a successor to King Otho of Greece. These men were the father and brother of the sixteenth earl.

It was natural, therefore, for young Stanley to enter politics, and after a brief career in the army he was elected to the House of Commons in 1865. Between 1874 and 1880, in Disraeli's Ministry, he was in turn Financial Secretary of War, Financial Secretary to the Treasury, and Secretary of State for War. He was Secretary for the Colonies in the Salisbury Ministry from 1885 to 1886, and then served for two years as President of the Board of Trade. From 1888 until 1893 he was Governor-General of Canada, a position in which he won great popularity. He had been created Baron Stanley of Preston in 1886, and in 1893, soon after his return to England, succeeded his brother as Earl of Derby. From 1900 to 1903 he was again Financial Secretary to the War Office, and then for two years was Postmaster-General.

DE RESZKE, *de resh'ke,* the family name of two brothers, famous in grand opera. See Reszke, De.

DER'VISH, a Persian word meaning *seeking doors,* or *beggar,* is the general term applied to members of Mohammedan religious fraternities who lead solitary, self-denying lives, who solicit alms and are subject to peculiar religious frenzies. Their origin dates back to the earliest days of the Islam faith. There are various orders, or brotherhoods, whose rituals may consist of the repetition of certain prayers or supplications to Allah, of the elaborate whirlings or writhings of the dancing dervishes, or of the frenzied performances of the howling variety, who shriek, mutilate their bodies and swallow hot coals and serpents. They are supposed by the faithful natives to possess miraculous healing and divining powers, and they exercise considerable influence over the lower classes. Whether as fanatics or as fakirs, they contribute an important share to the mysticism of the East.

DESCARTES, *da kahrt',* René (1596-1650), a celebrated French scholar, whose achievements in philosophy have won him the title "father of modern philosophy," and who is also honored as the inventor of analytical geometry. He was born in the province of Touraine, and was educated at the Jesuit College at La Flèche. There he was regarded as one of the most promising boys in the school, but it is significant that when he left La Flèche, at the age of sixteen, he threw aside his books and endeavored to forget everything he had learned. This was the result of his dissatisfaction with prevailing methods and theories of learning, which made him resolve to keep his mind open to the reception of the truth as it should be presented to him.

In 1617 he entered the army, but, not finding the life of a soldier much of an aid in the search for truth, he abandoned his military career and settled in Holland. In that country he worked out his philosophical system, wrote his most important books and gathered about him a group of disciples. In 1649 he accepted an invitation from Queen Christina to go to Sweden, but died a few months after arriving at her court.

By establishing an original philosophic principle, Descartes began a new era in the history of philosophy. He asserted, first, that, as all existing knowledge rested on an unstable foundation, the first step to take was to doubt everything that could be doubted. He found the only indisputable fact to be his own existence as a doubter and a thinker. That is, he knew that he thought, and therefore could not doubt that he, the thinker, existed. This relation he expressed in the now-famous saying, *Cogito, ergo sum* (I think; therefore I exist).

Beginning with his own self-conscious existence, he reasoned that there were other ideas as clearly and distinctly true as the surety of one's existence; the first of these ideas is that God is the absolutely perfect being. We do not of ourselves originate this idea, because the imperfect cannot originate the perfect, but it is formed in our minds by God himself. The principles thus absolutely and directly known he classified as innate ideas.

The influence of Descartes was as far-reaching on the progress of mathematics as on philosophic thought, and he ranks among the foremost mathematicians of his time. His most important writings include *Essays, Geometry, Discourses on the Method of Reasoning* and *Principles of Philosophy.*

DESCHANEL, Paul Eugene Louis (1856-1922), the President of France during the year 1920, successor to Raymond Poincaire, the great war President. Deschanel entered public life soon after completing his education at the College Sainte-Barbe and Lycee Condorcet. He filled the humbler stations of prefect in the departments of Brest and Seine-et-Marne, then was elected to the national Chamber of Deputies in 1896, of which he became president in 1898, continuing as such until 1902. He was then Commissioner of Colonial Affairs for seven years, after which he returned to the Chamber of Deputies; he was its president for the second time when elected President of the republic, defeating Clemenceau, beloved Premier and "Tiger of France."

DESERT, *dez'ert,* a region with vegetation insufficient to support human life. It may be hot, like the great Sahara, or cold, like the tundras of Siberia. In the former case lack of rainfall is its cause, in the latter, lack of heat. Rainless regions, however, are deserts according to the usual acceptance of the term. In some instances they exist because mountain ranges lying between them and the ocean from which the prevailing winds blow drain the moisture from all clouds that pass. Sometimes the air may flow into a region of greater warmth; it therefore becomes drier.

Characteristics. A desert is seldom a monotonous, flat waste of barren sand. Much of it is

THE DESERT. Wherever he may be, the Mohammedan prays three times a day, his face towards Mecca. The scene is the Arabian desert. Below, an oasis in Sahara.

rocky or boulder-strewn, some of it is deeply cut by the torrents which follow a burst of rain. The dry sand-bearing wind chisels the rocks into fantastic figures, and forms the surface of the plain in ever-shifting waves and ripples like those of the ocean. Sometimes one of these waves, a traveling *dune,* is a few hundred feet high. Wherever there are springs, or where a near-by mountain causes more frequent rain, there are oases, green islands in the sea of desolation. In the oases of the Sahara date palms flourish naturally, and many kinds of fruit and grain may be cultivated. Some of the oases are only large enough to support one or two people, others will nourish two million.

The animal and vegetable life of the desert is well adapted to its surroundings. The article CAMEL tells how this animal is suited to its arid environment, and the article CACTUS, how that plant thrives in the Great American Desert. The lizards and other small creatures of arid regions, which have no place to hide from enemies, are protected by their imitative coloring (see PROTECTIVE COLORATION). Many of them sleep through the hot summer, or burrow from the sun, and all the animals of the desert have the ability to close their nostrils and eyes to the blowing sand. Even the men of the desert, the wandering Arabs, are able to subsist on less food than more civilized peoples require.

Isaiah's prophecy, "The desert shall rejoice and blossom as the rose," is being fulfilled under modern irrigation. The desert soil when watered is apparently more fertile than that of regions which vegetate naturally, for it becomes virgin soil.

Geography. The greatest desert of the world is the Sahara in Africa, which continues eastward in the Arabian and Central Asian deserts to the Desert of Gobi, reaching nearly to Peking. There are other large deserts in all the continents but Europe. Much of Northern Mexico is arid, and this region extends slightly into the United States, forming what is known in Arizona and adjacent states as the Great American Desert.

Related Subjects. In the following articles will be found additional information bearing on the general topic of deserts:

Arabs	Kalahari Desert
Dune	Oasis
Gobi	Palm
Irrigation	Sahara

DES MOINES, *da moin',* IOWA, the capital and largest city of the state and the county seat of Polk County, is situated near the geographical center of the state, 175 miles west of Davenport, 350 miles west of Chicago and 155 miles east and north of Omaha. Des Moines is on the west and east banks of the Des Moines River, at the mouth of the Raccoon. Both streams are crossed by several good bridges within the city limits. It is served by four interurban lines and by the Chicago, Burlington & Quincy; the Chicago Great Western; the Chicago, Milwaukee & Saint Paul; the Chicago & North Western; the Chicago, Rock Island & Pacific; the Fort Dodge, Des Moines & Southern; the Minneapolis & Saint Louis, and the Wabash railroads. The population, largely American, was 86,368 in 1910 and 126,468 in 1920.

Des Moines covers an area of fifty-four square miles. The business section is along the river, the more attractive residence portion occupying the higher ground in the northwest and northeast sections of the city. The park system covers over 700 acres and includes the grounds (eighty-three acres) of the capitol, and Greenwood, Union, Grand View, Waveland and Riverview parks.

Public Buildings. The state capitol, erected at a cost of about $3,000,000, occupies a prominent position on the east side of the river. It contains the mural painting, *Westward,* by Edwin Blashfield. Other prominent buildings are the United States government building, Polk County courthouse, the municipal building, the post office, built in 1910 at a cost of $500,000, the Iowa Historical building, state arsenal, public library, coliseum, East High School building, Y. W. C. A. and Y. M. C. A. buildings, the Municipal Market House and Mercy Hospital. There are nearly one hundred churches, many of them distinguished for beauty of architecture.

Institutions. Des Moines is the seat of Drake University (non-sectarian), Des Moines College (Baptist), Highland Park College (Presbyterian), Danish Lutheran College, Cumming School of Art, Iowa College of Medicine and Surgery and the College of Osteopathy. A military post was established here by act of Congress in 1910, the land and equipment costing $1,200,000, and this is occupied by a regiment of cavalry. Each fall the state fair held in Des Moines is a festive occasion which brings thousands of visitors to the city.

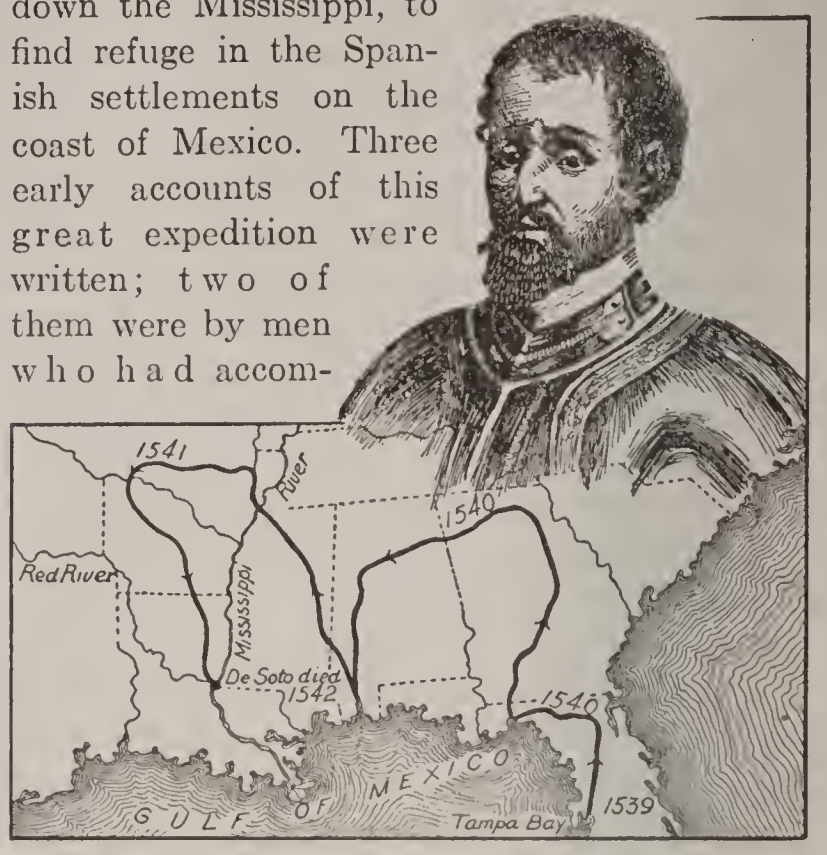
Industry. Mining, manufacture, meat packing and shipping are the chief industries. Rich coal deposits are found in the vicinity of Des

Moines, and nearly 4,000 men are engaged in coal mining. The mines have an annual output of 3,500,000 tons. The manufactures of the city are important and include books and magazines, foundry and machine shop products, structural-iron, engines and boilers, furnaces, agricultural implements, wagons and carriages, harness, axle grease, washing machines, furniture, pottery, brick and tile, sewer pipe, Portland cement, glue, incubators, cotton and woolen goods, clothing, confectionery, crackers, soap, twine, linseed oil, wall paper and patent medicines. The city has extensive wholesale interests and is an important center of the insurance business.

History. The first Fort Des Moines was established here in 1843, and the place was opened for settlement the same year. It was incorporated as a town in 1851 and in 1857 became a city and also the state capital, the seat of government being removed from Iowa City for the sake of a more central location. In 1907 the city adopted a new charter embodying what is known as the "Des Moines Plan." It provides for a ruling council of five, chosen biennially, nominated at a non-partisan primary and voted for on a non-partisan ticket by the electors of the entire city. The city has the power to recall any commissioner and can compel the passage of any law or ordinance. See COMMISSION FORM OF GOVERNMENT.

The name of the city is taken from that of the river, which the Indians named *Moingona*. Trappist monks early visited this country, and the stream came to be the Des Moines, meaning *of the monks*.

DE SOTO, *de so'to,* FERNANDO (1500-1542), a hardy and intrepid Spanish explorer who earned a place for all time in the lists of famous men by his discovery of the Mississippi River. Because of the great hardships involved and treachery of the Indians he lost his life before he could announce to the world his great achievement. After he had become famous and wealthy in the conquest of Peru, De Soto returned to Spain, but was sent to be governor of Cuba and Florida in 1539. No man had previously dared to enter the heart of what is now the Southern United States, but De Soto planned many brilliant adventures in that section when he started out with his company of 600 men. Led astray by false Indian guides through the dense jungles, he lost many of his followers in hostile attacks from the red men. After three years of wandering, De Soto and the few who still lived started back home, but the leader died of fever and was buried in the depths of the great river he had discovered. The survivors built crude boats and floated down the Mississippi, to find refuge in the Spanish settlements on the coast of Mexico. Three early accounts of this great expedition were written; two of them were by men who had accompanied De Soto, the third and most famous by the Inca historian, Garcilazo de la Vega. The latter, however, is little read.



FERNANDO DE SOTO

Portrait of the explorer and map of his route through the Southern United States.

DESTINN, *des'tin,* EMMY (1878-), a Bohemian operatic soprano who has become a general favorite with American audiences. She began her musical education with lessons on the violin, in her native city of Prague, but later commenced training for the operatic stage under the direction of Madame Loewe-Destinn. Substituting her teacher's name for her family name, Kittl, she made as Santuzza (in her debut in 1897 *Cavalleria Rusticana*), at the Royal Opera House, Berlin. Though her success in this rôle established her position as an operatic soprano, she first became widely famous on her appearance as Senta in the initial performance of Wagner's *Flying Dutchman* at Bayreuth (1901).

EMMY DESTINN

Six years later she was invited by Strauss to act the rôle of Salome at the first Paris

production of that opera. The year 1908 marked her first appearance in America, at the New York Metropolitan Opera House. Included in her repertory of over eighty operas are *Aïda, Mignon, Tannhäuser, The Magic Flute, La Boheme, Madame Butterfly* and *The Flying Dutchman,* the soprano rôles of the two latter being her favorite parts. Her voice is also widely known to buyers of phonograph records. She delights in writing and in collecting rare books and beautiful bindings. In 1915 Mlle. Destinn took out her first naturalization papers to become a citizen of the United States. Though under contract to appear in opera in her newly-adopted country for the season 1916-1917, she was detained in Europe by government officials because of the War of the Nations, then in its third year.

DETROIT, MICH., called the *City of the Straits,* on the *Dardanelles of America,* the first city in the state in population, and in 1920 fourth among the cities of the Union, the county seat of Wayne County and the most important city in the world in the manufacture of automobiles. Within ten miles of the Detroit city hall there are more men who possess scientific knowledge of automobile construction than can be found in any other like area on the globe. The city is situated on the southeastern border of the state, on the Detroit River. This stream is really a strait which connects Lake Erie with Lake Saint Clair and at this point separates the United States from Canada; it forms one of the busiest waterways in the world. Lansing, the state capital, is eighty-eight miles northwest; Toledo, Ohio, is sixty-two miles distant, nearly south; Chicago is 284 miles west and south.

Exceptional transportation service is afforded by the Grand Trunk; the Michigan Central; the New York Central; the Wabash; the Detroit, Toledo & Ironton; the Pere Marquette, and the Canadian Pacific railroads. Passenger and freight steamers connect with all important lake ports, and interurban lines have extensive mileage from the city in various directions west of the river; ferries connect with Windsor, on the Canadian side. In recent years the city has had a marvelous growth, the population of 993,678 by the Fourteenth Census in 1920 showing an increase of 527,305 since 1910. In 1917 the city claimed to have reached the rank of the fifth largest American city; three years later it was even better. Germans and Canadians predominate in a mixed foreign element, which comprises about one-third of the total population. The area of the city is forty-two square miles.

METROPOLITAN DISTRICT

1—Grosse Pointe
2—Hamtramck
3—Greenfield
4—Springwells
5—Ecorse
6—Sandwich
7—Windsor

The dotted line in the river is the international boundary.

Location. The land on which Detroit is built rises gently from the river. This stream, half a mile wide, is fed by the Great Lakes, and affords one of the best harbors on these waters to vessels, even those of the largest size. Along

the river front for several miles the shore is lined with wharves, elevators and warehouses, and here the railroads have located passenger and freight stations. To the north for a distance of about twenty miles lies the Saint Clair Flats, a beautiful residential district, where many wealthy Detroit merchants have built handsome homes. Windsor, across the river, is in reality a suburb of Detroit, and is the terminus of Canadian traffic. Fort Wayne, with its extensive batteries, guards the channel.

Parks and Boulevards. Detroit is one of the most beautiful cities in the Union. Its park reservation of 1,200 acres is divided into twenty-one parks, the most noted of these being Belle Isle (700 acres), an island of great natural beauty on which has been expended $1,500,000. It lies opposite the eastern section of the city and is made accessible by a bridge which was constructed at a cost of $315,000. Its area is to be further increased to the extent of 100 acres by including the southwestern shoals. Here will be erected a fountain for which the late James Scott gave his entire fortune of $500,000. Palmer Park, a forest of 141 acres, has a colonial log house, a colonial casino and a collection of colonial relics. Grand Circus is a semi-circular park of five acres in the heart of the city, from which the streets radiate as from the hub of a wheel; their intersections of streets which run at right angles form a number of triangular parks, some of which are ornamented with beautiful fountains. The Campus Martius is a large plaza between Grand Circus and the river, around which are clustered some of the city's finest public and office buildings. It gives an impression of light and space seldom found in the business district of a large city; the plaza contains the Michigan Soldiers' and Sailors' Monument.

The streets of Detroit are broad and well-shaded, and have a wide reputation for cleanliness. Woodward Avenue performs the double duty of business street and residential boulevard. It begins at the river, and, passing through Grand Circus, the residential district and beyond the limits, divides the city into halves. Griswold Street is the Wall Street of Detroit. There are fine residential districts along Cass Avenue, Boston and Chicago boulevards, in Virginia Park and in Arden Park, but the city's pride rests in Grand Boulevard, which begins at the river on the north and winds about the city to the river on the south.

Buildings. The most conspicuous of the city's buildings is the massive Wayne County courthouse. Others of note are the Federal building, constructed at a cost of $2,500,000; the city hall, facing the Campus Martius, built of sandstone at a cost of $600,000; the handsome new post office; the old post office, now used as the customhouse; the Chamber of Commerce; Detroit Athletic Club House; Masonic Temple; Y. M. C. A. building; the fine passenger station of the Michigan Central Railway; Union Station, and the Majestic, Penobscot, Ford and other office buildings of the most modern "skyscraper" variety. The bank buildings, too, are handsome, up-to-date structures, those of the Detroit Trust Company, Union Trust Company, Dime Savings Bank, First and Old Detroit National Bank and the People's Bank being especially noteworthy. The Detroit Savings Bank is the oldest bank in the state. Of the numerous church buildings the Roman Catholic Cathedral is the largest, but the Church of Saint Anne is the most noted, since the original structure was the first place of worship erected in the city. The First Presbyterian, Fort Street Presbyterian, Saint John's, Trinity and Christ (Episcopal), Woodward Avenue Baptist and Central Methodist churches and the Sacred Heart Convent are all structures of unusual architectural beauty.

Institutions. Besides an excellent public school system, the city has Detroit University (opened by the Jesuits in 1877 as Detroit College), Michigan College of Medicine and Surgery, Detroit College of Law and Detroit Homeopathic College. There are nine branches of the central public library, which alone contains 278,000 volumes. The Museum of Art has a fine collection of historic and scientific relics valued at $300,000, including the Scripps gallery and the Stearns collection. The House of Correction, the buildings, grounds and equipment of which cost $600,000, is a widely-known reformatory. Saint Mary's, Red Cross, Herman Kiefer and the United States Marine hospitals are the prominent institutions of this kind, and there are homes for the friendless, the aged, the poor and the incurable, and Protestant and Roman Catholic orphanages.

Commerce. Detroit is the gateway for all the commerce between the eastern and western lake ports and for a large part of the railway passenger and freight traffic between Canada and the great Middle West (see Sault Sainte Marie Canal). The volume of trade and

travel has been further increased by the construction of a new tunnel built under the Detroit River by the Michigan Central Railroad. The chief exports are grain, flour, hogs and hog products, cattle, beef, hides, sheep, wool, cotton, coal, iron and steel products and lumber, although shipments of the last-named have not been so large in recent years as formerly. It also receives either for its own use or for shipment immense quantities of the agricultural and dairy products of the state. Detroit has the largest dry-dock on the Great Lakes. A United States internal revenue office and a department in charge of lake lighthouses are located here. All freighters receive and deliver mail at this point without stopping.

Manufactures. The making of automobiles and their parts is the leading industry. In Detroit is produced more than half of the total output of the United States; in one month of the year 1916 the factory of one low-priced model alone turned out 58,000 cars. At the opening of the season for making 1916 models, 80,000 people were employed in this industry. In the beginning, Detroit was the logical point for the establishment of this great enterprise, as it was largely engaged in the manufacture of marine gasoline engines, and the state was already noted for making fine carriages. But the making of motor vehicles is not the only employment of the people of Detroit, as the city also has extensive manufactures of adding-machines, drugs, chemicals and tobacco products, some of these taking leading rank in the output of the United States. The lumber, tanning and meat-packing industries are also of considerable importance. Here, too, are located one of the most complete shipyards on the Great Lakes and one of the largest seed houses in the world.

History. As early as 1648 this site was visited by Frenchmen, but no permanent settlement was made until 1701. In this year Antoine de la Mothe Cadillac, the first commandant of the French possessions in this locality, built Fort Pontchartrain and garrisoned it with fifty soldiers and fifty colonists. In 1760, at the close of the French and Indian War, Major Robert Rogers seized the place; it suffered frequent attacks by Indians under Pontiac in 1763, but was saved by a heroic defense. In 1778, when the British built Fort Lernoult, there were about 300 inhabitants, the settlement consisting chiefly of log cabins and a Roman Catholic church; the name was changed to Fort Shelby in 1796.

The town was incorporated in 1802, but three years later was almost completely destroyed by fire, only two buildings being left standing. Rebuilding was commenced at once on a large scale, and the new settlement in the same year became the capital of Michigan Territory. It was taken by the British in the War of 1812, and was retaken by the Americans in 1813. Detroit was incorporated as a village in 1815 and as a city in 1824. In 1837 it became the capital of the state and it was the seat of government until the capital was removed to Lansing in 1847. From the time it became a city its growth has been uninterrupted, and its increase in population, wealth, building construction and commerce since 1900 is remarkable. In 1901 the city celebrated the centennial anniversary of its settlement. Detroit is a French word meaning *strait,* hence the popular name, *City of the Straits.* J.S.C.

Consult Farmer's *Historic Towns of the Western States;* Burton's *Cadillac's Village: A History of the Settlement of Detroit.*

DETROIT RIVER, a short river, or strait, connecting Lake Erie and Lake Saint Clair and separating the state of Michigan from the province of Ontario, Canada. It is one of the world's most important commercial highways and carries more tonnage of shipping than any other stream or canal, for all the grain shipped by boat from the great Northwest and all the immense lake shipments of iron ore from Minnesota, Wisconsin and Northern Michigan to the East pass through Detroit River. It is twenty-eight miles long, and its depth is sufficient to permit the passage of the largest vessels afloat. Its breadth varies from one-half mile to three miles. The name is derived from the French *detroit,* meaning *strait.* The scenery along its banks is inviting, and its upper section, called the Saint Clair Flats, is beautiful in spots, being studded with islands which are very popular as summer resorts. A map showing the course of the river appears with the article DETROIT.

DEUCALION, *du ka'li on,* the Noah of Greek mythology, was the mythological son of Prometheus. He and his wife Pyrrha, as faithful servants of the gods, were the only ones saved when Jupiter caused a deluge to destroy the world on account of the wickedness of mankind. In a wooden chest made on the advice of Prometheus, Deucalion and Pyrrha floated on the waters nine days, finally landing on the summit of Mount Parnassus. When the deluge subsided, finding the land depopulated,

they sought the oracle at Delphi for information as to how they could repeople the earth. They were told to throw behind them the bones of their mother. Interpreting that to mean their mother earth, they threw stones over their shoulders, which on striking the earth became men and women, strong and hardy. Deucalion became the ancestor of the Greeks through his son Hellen.

DEUTERONOMY, *du ter on' o mi,* the fifth book of the Old Testament, in which Moses imparted to the Israelites, whom he had led through the Wilderness, the law of their nation. It is therefore known as the *Book of the Law.* These people, most of whom were children when they left Egypt, had traveled nearly forty years and were on the eve of entering Canaan, the Promised Land. Before they crossed the Jordan, Moses gathered them around him in the valley to deliver his farewell address, for God had told him that he could not enter with them because of his disobedience (see MOSES). Moses wished the people to understand the principles of their national law, which was given to their fathers on Mount Sinai. After giving his address, Moses appointed Joshua as his successor to rule the people when they entered the Promised Land. In the last chapter there is a record of Moses' death and burial in the land of Moab. The language of this book is remarkable for its strength and beauty. It is supposed that a portion of Deuteronomy was discovered during the reign of Josiah (*II Kings* XXII, 8).

DEV'IL, also called SATAN, the chief evil spirit, the author of evil and the opposer of God. The word comes from the Greek and means *slanderer* or *false accuser. Satan* in Hebrew means *enemy,* and when used in this sense means the enemy of God and man. But *Satan* as used in *Job* means an *accuser,* and is applied to one of God's messengers who appear before God (*Job* I, 6). In the third chapter of *Genesis* the serpent is represented as the author and introducer of evil to man, and for this reason the Devil is sometimes called the *Serpent.*

Most religions recognize one or more evil spirits and acknowledge in their creeds a constant warfare between the good and the evil spirits. In most instances this warfare is moral; but among some peoples disease, suffering and such calamities as famine, hail and flood are attributed to evil spirits, and among the early Christians these were believed to be the work of the Devil. There are doubtless some still who hold to that belief.

There is a distinction between evil spirits and the evil spirit who is the Prince of Darkness; evil spirits are demons—emissaries or aids of the Devil. The devils so often mentioned in the New Testament were demons who possessed certain people, according to popular belief, and whom Christ cast out. This belief in demons among the Jews is similar to the beliefs of the ancient Greeks, Romans and other European peoples in various gods to whom they attributed all sorts of characteristics. The ancient Germans believed in the personality of the evil spirit and had a common proverb, "Where the Devil cannot come he sends his grandmother." Others believe the Devil to be a fallen angel. This is Milton's idea, in *Paradise Lost,* where he says:

> From morn
> To noon he fell, from noon to dewy eve—
> A summer day: and with the setting sun,
> Dropt from the zenith like a falling star.

DEVIL FISH, a name given to various species of sea monsters of weird appearance, often specified as the *angler, sea-devil, toad-fish,* etc. In the United States and Canada the term is applied to the *ray,* a fish of huge proportions, which propels itself in the ocean by flapping its pectoral fins, or sides, up and down. It is occasionally hunted with harpoons for sport. In California the name is sometimes given to the gray whale.

DEVILS LAKE, N. D., the county seat of Ramsey County, is situated on the north shore of Devils Lake, in the northeastern part of the state. It is eighty-nine miles northwest of Grand Forks and 260 miles southwest of Winnipeg, and is served by the Great Northern Railroad, built in 1883, and the Soo Line, built in 1912. The Farmers' Grain and Shipping Company also operates a short line of railroad. The population in 1920 was 5,140.

The city covers an area of about three square miles along the lake. This body of water, with shores crooked and picturesque, is forty miles in length. The surrounding land is a rich agricultural country, and diversified farming and stock raising furnish the city produce for its most important industrial plants, which are creameries and grist mills. Railroad shops of the Great Northern are located here.

Near the town are a number of places of interest, among which are Devils Lake Chautauqua Grounds; Sully's Hill National Park; old Fort Totton, now used as an Indian school;

and the State University Biological Station. Prominent buildings of the city are the Federal building, erected in 1908 at a cost of $150,000; a Carnegie Library, a General Hospital, Mercy Hospital and a Masonic Temple. Devils Lake contains a school for the deaf and Saint Mary's Academy (Roman Catholic).

"Minnewaukan," meaning *Spirit Water,* was the Indian name for Devils Lake. The town, once an Indian village, was settled by white men about 1882. It was incorporated in 1892, and adopted the commission form of government in 1913. A.A.P.

DEVIL WORSHIP, the practice of certain barbarian tribes of Asia, Africa and South America, who worship the Devil on the principle that the powers of evil are as much to be reckoned with as those of good, and must be placated. The Yezidees, or Devil worshipers of Turkish and Russian Armenia and the valley of the Tigris, observe some Christian ceremonies such as infant baptism, and revere the authority of the Old Testament in preference to that of the New Testament or of the Koran. Their worship includes Christ, the Devil, Allah and the sun.

DEVONIAN, *de vo'ni an,* **PERIOD,** or **THE AGE OF FISHES,** was that period of geologic time between the Silurian and the Carboniferous periods of the Paleozoic Era (which see). The rocks formed during the period constitute the *Devonian System,* and these are widely extended, both in America and in Europe. The name *Devonian* is derived from the name given rocks of this period that are common in Devonshire and Cornwall, England. They are chiefly sandstones, limestones and slates containing more or less lime. The Old Red Sandstone is one of the most important formations of the period (see OLD RED SANDSTONE).

North America was divided by the sea into two great land masses, the Eastern, represented by the Appalachian Mountains, and extending southward as far as Georgia and westward as far as the Blue Ridge Mountains, and the Continental, or Western, division, which extended westward from the Hudson River as far as Western New York, Michigan and a part of Ontario. It is also probable that portions of Colorado, the Black Hills in South Dakota, the central part of Texas and a long, narrow strip of land bordered by the great basin in Nevada and Utah were above the sea.

The rocks of the Devonian Period abound in fossils. Among the plants, remains of gigantic horsetails and club mosses are found, foreshadowing the wealth of vegetation which was to follow in the Carboniferous Era. There were shellfish of all descriptions, and in some localities extensive beds of coral. Such sea animals as the star fish, the lobster and the horseshoe crab were common. This was the time when fishes reached a period of high development. For this reason some geologists have named it the *Age of Fishes.* Sharks lived in both salt and fresh water, and other large fishes, some over twenty feet in length, were common. Some of the representatives of the fishes of the time are now seen in the pickerel and the swordfish, but these are smaller than their ancestors of this remote period.

The fossil record of land life shows the existence of snails, insects, myriapods, scorpions and amphibians. W.F.R.

Related Subjects. To connect this period of geologic time with others, and to understand its history more clearly, reference is directed to the following articles in these volumes:

Carboniferous Period	Geology
Fossil	Silurian Period

DEVONSHIRE, *dev'on sheer,* VICTOR CHRISTIAN WILLIAM CAVENDISH, Ninth Duke of (1868-), appointed in 1916 to succeed His Royal Highness, the Duke of Connaught, as Governor-General of the Dominion of Canada. The duke was educated at Eton and at Trinity College, Cambridge, and in 1891 entered the House of Commons as a Liberal-Unionist. He continued to sit in the House until 1908, when he succeeded to the dukedom on the death of his uncle, the eighth Duke of Denvonshire. He was from 1900 to 1903 treasurer of His Majesty's household, and was then for two years financial secretary to the Treasury. He is Lord-Lieutenant of Derbyshire and chancellor of Leeds University. His wife, whom he married in 1892, was Lady Evelyn Fitzmaurice, daughter of the fifth Marquis Landsdowne, who was Governor-General of Canada from 1883 to 1888.

The Duke of Devonshire is one of the great land owners of Great Britain. His estates amount to nearly 190,000 acres, including mineral lands and forests. He owns a valuable library of rare books and an art collection which is world famous. He is an ardent sportsman, particularly fond of hunting, is known as a patron of science, and is regarded as one of the most charming and democratic of the British peers. (See his portrait, in page of Governors-General in the article CANADA.)

The Cavendish Family. The family of Cav-

endish, of which the duke is the chief, has had many distinguished members. The first duke, William Cavendish (1640-1707), was conspicuous in political affairs in the days of Charles II and James II, and was one of the original seven who invited Prince William of Orange to the throne of England. He was created Duke of Devonshire in 1694. The nephew of the third duke was Henry Cavendish (1731-1800), the famous chemist who discovered the composition of water. The fifth duke, William (1748-1811), was the husband of Georgiana, whose beautiful features were portrayed by Gainsborough. The eighth duke, Spencer Cavendish (1833-1908), was better known by his courtesy title of Lord Hartington. He was for years a leader of the Liberals, but after Gladstone's conversion to Home Rule, Hartington led a new party, the Liberal-Unionist. On three occasions he might have become Prime Minister, but each time preferred to yield the honor to another. G.H.L.

DEW. When you go into the garden on a bright summer morning you find drops of water on the grass, leaves and flowers, glistening in the sun. What are they? Where did they come from? First, these tiny sparkling drops are *dew;* second, they come from the air and the ground.

How Dew Is Formed. The atmosphere at all times contains water vapor; the warmer the air becomes the more vapor it usually contains. When the atmosphere cools some of the vapor is condensed and forms water. This is what happens when a pitcher of ice water is set in a warm room; the moisture that collects on the outside of the pitcher is taken from the air that comes in contact with it. Dew is formed in the same way. At night the earth gives back to the atmosphere some of the heat that it absorbed from the sun during the day. Most of this heat passes off through the blades of grass and the leaves of plants, which become cooler than the surrounding air, and they therefore condense the moisture in the same way that the pitcher does.

The largest quantity of dew is formed on a clear, still night, when there is nothing to prevent the radiation of heat or to disturb the atmosphere. The layer of air next to the earth then becomes cooled and gives up its moisture. Wind prevents the formation of dew, because it keeps the atmosphere in motion and there is no chance for it to become cooled by contact with the plants. Clouds often prevent dew, because they reflect the escaping heat back to the earth and prevent sufficient cooling of the plants to enable them to condense the moisture. For the same reason dew is seldom formed under trees or other objects which reflect the heat back to the earth.

Some of the dew on plants rises from the earth in the form of vapor and is condensed the same as that from the atmosphere. Those objects which cool most rapidly collect the most dew. A board, for instance, is a poor radiator and collects but little dew, but large drops may collect on the head of a nail driven into the board. The ground under the board is dry, because there is no chance for the heat to escape from the covered ground. The heaviest dews are in tropical regions, where there is the greatest difference in temperature between day and night. In regions having little rainfall dew is of the greatest value to vegetation. When the temperature is below the freezing point *frost,* instead of dew, is formed. See FROST. C.R.M.

DEWEY, GEORGE (1837-1917), an American naval officer, known as the "hero of Manila," the first American officer after David Porter to be raised to the rank of admiral. His early education was received in his home city, Montpelier, Vt., and at Norwich University. At the age of seventeen he entered the Naval Academy at Annapolis, graduating fifth in his class. In 1865 he received a lieutenant's commission, was assigned to the sloop *Mississippi* under Farragut, and took part in the famous run past the forts that guarded New Orleans. He was commissioned lieutenant-commander in 1865 and served on the *Colorado* and *Kearsarge* for two years. In 1872 he was given command of the *Narragansett* in the Pacific Survey.

ADMIRAL DEWEY

When war was declared between Spain and the United States in 1898, Dewey was in Hongkong in command of the Asiatic squadron, having risen to the rank of commodore. The cable bore him this message: "Proceed at once to the Philippine Islands. Capture or destroy the Spanish fleet." Forty-eight hours later his six vessels, with the *Olympia* at their

head, were steaming toward Manila Bay. On May 1, 1898, he opened fire on the Spanish fleet of ten war vessels and two torpedo boats, and about noon of that day the last Spanish flag had been hauled down and the entire fleet destroyed. Not one American vessel was seriously disabled; not one man had been killed and only seven were injured.

He was soon after appointed admiral by President McKinley; Congress presented him with a sword, and all of his men received medals. On his return to New York in 1899 he received an ovation, and the people of the country, through popular subscription, presented him with a residence in Washington. In 1901 he was president of the Schley court of inquiry and a year later was placed in command of all united squadrons and fleets of the American navy. In 1908 he assumed the presidency of the naval board of strategy. At the time of his death he was the ranking naval officer of the world, by seniority.

DEWEY, JOHN (1859-), a distinguished American educator, philosopher and psychologist, who has attracted wide attention in the educational field by his theory of "immediate empiricism." According to this theory, things are what they are as shown by experience, and knowledge itself is a form of experience. Professor Dewey, in his teaching, makes practical applications of his views, and he belongs to the same school of thought as the distinguished American psychologist William James (which see).

He was born in Vermont and was graduated in 1879 at the University of Vermont, receiving, five years later, a Ph.D. degree from Johns Hopkins University. In 1888-1889 he was professor of philosophy at the University of Minnesota, held a like position at the University of Michigan from 1889 to 1894, and between 1894 and 1904 was director of the School of Education at the University of Chicago. In the latter year he was appointed professor of philosophy in Columbia University. His writings include, besides numerous contributions to periodicals, *Study of Ethics, School and Society, How to Think* and *Influence of Darwin on Philosophy.*

DEX'TRIN, a sticky substance made from starch, which it closely resembles in its chemical composition. Dextrin may be made by adding dried malt to water heated to 70° or 80° F., and then adding starch (the proportions being 10 parts malt to 100 parts starch), heating the mixture to 140° and maintaining this temperature for about twenty minutes, then raising it rapidly to the boiling point. A syrup is formed, which when boiled down forms a solid substance resembling glue. This is dextrin. Dextrin is used for gumming postage stamps, for sticking the colors upon cloth in calico printing, for making varnish and for numerous other purposes.

DIABASE, *di'a base,* a crystalline rock composed of lime-soda, feldspar and pyroxene. The feldspar usually appears in long, flat crystals that radiate from a center like the spokes of a wheel. When the grains of pyroxene are large the rock has a mottled appearance. Some diabase contains olivine in place of pyroxene, and has a green color.

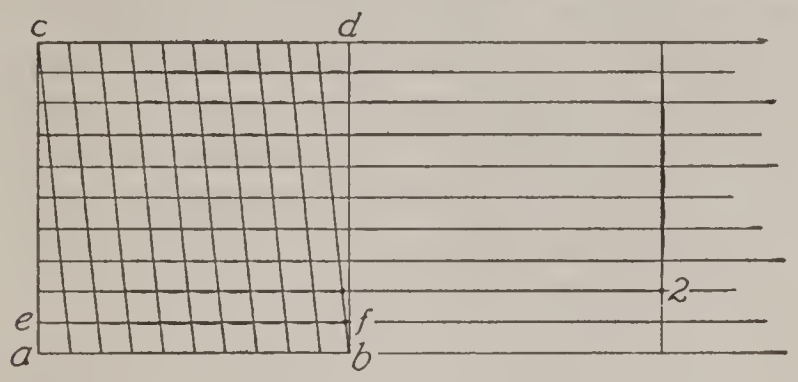
In most diabase the crystals are so small as to give it a massive appearance. It is a hard rock, very heavy and compact. The copper-bearing rock of Keweenaw Peninsula, Michigan, is diabase. Other noted examples are the Palisades on the Hudson River and the Hanging Hills near Meriden, Conn. In many places it occurs in dikes and veins. When it decays it forms depressed soil and boulders. See DIKE; BASALT; FELDSPAR; CRYSTALLINE ROCKS.

DIABETES, *di a be'teez,* the name applied to two types of a certain disease, both of which are characterized by the daily passage of an abnormal quantity of urine. *Diabetes insipidus* attacks children principally, and is a nervous ailment of a not very serious character. Intense thirst and the excretion of an unusual amount of urine are its characteristic symptoms. *Diabetes mellitus* is a serious disease of more common occurrence. A victim of this type of diabetes suffers from continual and intense thirst, dryness of the mouth and lips, loss of appetite, muscular weakness, emaciation, altered sight and in some cases mental disorder, such as indecision and melancholia. Instead of the normal passage of about three pints of urine a day, the diabetic passes from twenty to thirty pints daily. The liver of such a person does not properly carry on its function of transforming starches and sugars during assimilation, and as a result large quantities of liver sugar, resembling grape sugar, make their appearance in the urine. In many cases disease of the pancreas is a feature of diabetes.

Diabetics rarely recover, though some live for many years. In over half the cases death results from coma. Consumption of the lungs is a frequent cause of death; other possible complications are neuritis and paralysis, various

skin diseases, kidney disorders, carbuncles and gangrene. Dieting is the most satisfactory line of treatment, and this must be carried on under the direction of a physician who fully understands the case. The diabetic must not eat foods containing starch and sugar, or any food not readily digested. He must therefore avoid potatoes, turnips, carrots, cauliflower, peas, beans, apples, pears, oranges, gooseberries, plums, peaches, cornflour, white bread, rice, sago, tapioca, candy, pastry and sugar of any kind. Meat, game, poultry, fish, green vegetables, cheese, butter, eggs and nuts are permissible, and in place of white bread he may eat bran or gluten bread. W.A.E.

DIAG'ONAL SCALE, a scale consisting of a system of lines by means of which fractional parts of a unit of measurement may be measured and laid down by compasses. In surveying or laying out maps or plotting land this scale is



DIAGONAL SCALE

of great assistance. The accompanying diagram explains how the scale is used. The space from *a* to *b* represents one inch, and the space from *a* to *c* is also one inch. The square inch contained within *a b* and *a c* is divided into equal spaces by parallel lines. Each small space represents one-hundredth part of a square inch. One-hundredth part of a lineal inch is indicated by the line passing from *d* to *b* at the point where that line intersects the line *ef*. Two one-hundredths of an inch will be found at the intersecting point of the lines above, and so on. If it is required to measure one inch and two one-hundredths of an inch, place one point of the compass at the point marked *2*. The other, being placed at the (.) on the scale, will indicate the two one-hundredths. Each vertical line indicates ten one-hundredths of an inch.

DIALECT, *di'a lekt,* a term used in several closely related senses, but most commonly taken to mean the idiomatic language of a certain district or class, differing from that of other districts or classes, or from the generally accepted literary language (see IDIOM). In early days, before the establishment of easy means of communication and before the invention of printing, people of a certain locality in the course of years might so modify their language that other people, living but a few miles away and using what was originally the same language, could not understand them at all. This was once true in England, and is yet to some extent, although the adoption of a standard literary language has done much toward doing away with the differences, and has made them practically non-existent in the speech of well-educated Englishmen.

Just as Scotch is a dialect of the English language, so English is, or was, a dialect of the Germanic or Teutonic group of languages; but it has changed so radically through the centuries and established itself so firmly that it is never thought of as a dialect. Students of languages find much in the study of dialects which is enlightening, for often through the idioms of differing dialects derivations can be traced and resemblances can be discovered which could not be detected by an examination of a language in the more stable form.

"Dialect stories" are fiction which attempts to gain "local color" by the use of the idiomatic speech of the region with which it deals. Of late years a prejudice has grown up against such fiction, it being regarded as inartistic, and it is true that the method may be carried too far; but many of the best English novels make large use of dialect. They employ the dialect for the sake of the stories, however, instead of making it the excuse for the stories.

DIAMOND, *di'a mund,* a precious stone of wonderful luster and beauty, the most brilliant of all gems and the hardest substance known to man. Bidding defiance to the ravages wrought by time and wear, it holds a supreme place among the jewels, and because of its unconquerable hardness has become figuratively the emblem of fearlessness and invincibility.

Origin. The exact conditions under which diamonds are formed in the earth have not yet been discovered. They were first found in gravel and sands in streams, and later were discovered deep in the earth. Mined diamonds are found in ancient volcanic vents, which seems to indicate that they have been violently blown out of the interior of the earth by volcanic action, or that they have formed under the conditions of cooling lava. Recently, scientists have discovered that by heating pure prepared carbon and iron to intense heat by electricity, then letting the mass cool suddenly,

WORLD BOOK

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A KIMBERLEY MINE. Dangerous work far underground, loading diamond-bearing rock. Cars are hauled to the surface by elevators.

WORLD BOOK

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DIAMOND-BEARING ROCK.

Exposed to the air to disintegrate before working. Photographed at Kimberley.

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DIAMOND SORTERS. These men in South Africa are among the world's experts in valuing diamonds. Above, $30,000 in stones (mine prices).

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A DIAMOND "COMPOUND."

View of a typical "compound" and a scene photographed when workmen are off duty.

very small diamonds are formed at the center of the lump; this would seem to indicate the process of diamond formation—carbon subjected to great heat and the tremendous pressure of cooling. It has long been known that a beautiful diamond, if heated very hot in a vacuum, or place without air, expands or swells and becomes ordinary black charcoal. If subjected to intense heat while in the air, it disappears as carbonic acid gas.

Characteristics. Diamonds form in crystals (see CRYSTALLOGRAPHY). Some of the crystals have four sides, shaped like those of a cube; some have eight sides, forming a double pyramid; others have twelve faces, each face being a parallelogram, and there are various other forms. The great brilliance of the cut stone, which is not disclosed in the rough, is due to the power of the diamond to refract, or break up, light, and this power is very much enhanced by the little planes, or *facets,* of the cut. The stones cannot be dissolved or hurt by acids and can be made to glow in the dark by rubbing, or after having been in the sunlight or in the presence of radium. Some stones, when subjected to a current of electricity in a vacuum, glow wonderfully. As diamonds are the hardest material known in the world, they can be cut and polished only by contact with other diamonds.

Value. We sometimes confuse the meanings of the two words, *valuable* and *costly.* Diamonds are certainly among the most costly things in the world, partly because they are very rare. There is no reason why the diamond should be a rare stone, except from the fact that those who own the fabulously-rich mines purposely limit the output. There are known to be sufficient diamonds in the mines of the world to supply all the people who would like to own such a stone, and they could be sold at retail at $10 per carat at a reasonable profit. However, the mine owners restrict the output every year to meet only the demand that continues at the high prices maintained. Diamonds are weighed in *carats;* in the rough at the mines they are priced at sums ranging from $8 to $15 a carat, and when ready for sale they cost $100 to $200 or more per carat, according to quality. That is only an average estimate. Some of the larger stones have been valued at fabulous sums even before cutting. Some cuts are more costly than others, for cutting is very difficult, and the kind of cut depends somewhat upon the quality of the stone. The cuts most used are the *brilliant* and the *rose.*

Diamond Cutting. In olden times, diamonds were cut in a very crude fashion. In the Dutch city of Bruges in 1746 was established a trade guild of lapidaries, or stone cutters, under the master cutter, L. von Berquem. Other guilds were soon established in Antwerp and Amsterdam, and these cities, particularly the latter, have to this day retained preëminence in the art of diamond cutting. The tools used are exceedingly simple, and practically everything depends upon the skill and knowledge of the artisan.

Uses of the Diamond. Because of its hardness, it is superior to any other material for cutting and drilling. Glass fitters use diamond points with which to cut their glass. Diamond dust, saved from the process of cutting, is used for fine polishing. The points of engraving tools for hard surfaces, such as glass and steel, are diamond points. Very small diamonds are used as bearings in watches, and on the points of gold pens; and larger ones are lenses in microscopes. On the end of stone drills, diamond points are invaluable because they stand great weight and great pressure. Carbonado, a form of diamond not suitable for gems, is more valuable on drills than the diamond itself, for it is slightly harder, is not so perfectly crystallized, therefore has less cleavage and is less likely to break. Diamonds in which are drilled tapering holes are used for wire drawing. A permanent, indestructible diamond needle is used in some varieties of talking machines. Besides these most common uses, there are a few other technical mechanical uses of diamonds.

Diamond Fields. The most ancient gems are known to have come from India, where the industry of gathering these stones was first carried on. The natives of low caste were the workers in this field, and the methods employed were the most primitive. The stones were found in the gravel and the sands of streams and removed as are gold nuggets in placer mining, the fine gravel being washed away in sluices and the nuggets picked out from among the larger stones. Golconda was the market for many of the Indian stones which have become known by that name. At the present time no diamonds are exported from India, and many of the old mines are no longer worked. In Brazil in 1727 valuable diamond fields were discovered whose stones excelled in quality those of India.

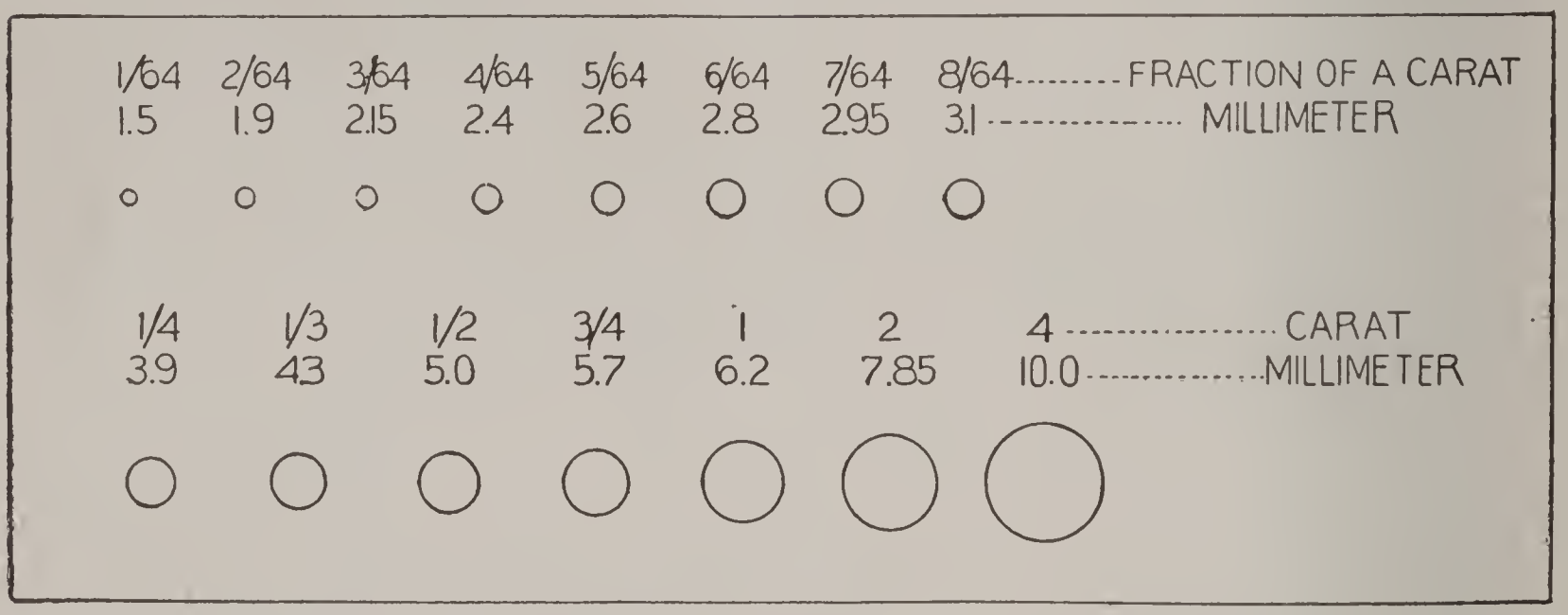
The story goes that in the year 1867 a traveler in South Africa paid a few pennies for a

pretty pebble picked up from the bed of the Vaal stream by the children of a Boer farmer. This stone was afterwards sold in Paris for $2,500, and eventually led to the discovery of the rich diamond fields of South Africa. These mines at present yield ninety-eight per cent of the total yearly product of diamonds, and the total value of the stones obtained since the opening of the mines amounted to more than $700,000,000 in 1916. The stones are both washed from river gravel and mined out of the earth. The miners and their families live, voluntary prisoners, within great enclosures called "compounds," to reduce to a minimum the theft of valuable stones.

Diamonds have been found in the United States (particularly in Arkansas), British Guiana, Russia, China, Sumatra and Australia, but in comparatively small quantities.

Famous Diamonds. Very large diamonds of rare quality are almost without exception the property of states and royal personages. The largest Golconda diamond, called the *Great Mogul,* was once in the possession of Shah Jehan, builder of the famous Taj Mahal (which see). The *Orloff,* a magnificent Russian crown jewel, bought by Prince Orloff for the Empress Catharine II, is said to have been stolen from the eye of an idol in a Brahman temple. From the first thief it was acquired by a second, and by him sold to the Prince. The *Kohinoor,* now in possession of the royal family of England, was for many centuries handed down from one Indian prince to another. It was taken when the British invaded the Punjab and presented by the East Indian Company to Queen Victoria in 1850. The *Regent,* or *Pitt,* diamond, is an Indian gem, one of the most beautiful of the large stones, and is owned by France and exhibited in the Louvre. The most famous of the Brazilian stones is the *Star of the South.* Many valuations have been placed upon these wonderful gems, but there is no means of valuing them correctly; not one is listed at less than half a million dollars, though no offer of many times such a sum would probably be given the slightest consideration.

The largest stone ever discovered of which there is any record, three times the size of the largest then known, was found January 26, 1905, in the Premier mine of South Africa. It was called the *Cullinan* diamond, from the name of its finder, and was purchased by the Transvaal government and presented to King Edward VII of England. It was sent to Amsterdam to be cut, and was divided into nine large stones, two of them among the largest brilliants in existence, and into a number of small stones.



ACTUAL SIZE DIAMOND CHART FOR JUDGING STONES

How to Judge Diamonds. Weight, purity and color are three essential points to consider in buying a diamond. The accompanying diagram shows the weight in carats of diamonds from 1.5 to 10 millimeters in diameter. In regard to purity, these gems are subject to three kinds of flaws: the presence of foreign minerals, gas- or moisture-pores, and small fissures called *feathers.* Specks of coal and graphite are the most common flaws of the first class. These are known as *sand* when they can be seen by the naked eye, and *dust* when they are microscopic. Sometimes they appear in streaks or silky layers, and sometimes they form clouds that diminish the transparency of the stone and impair its color. Gas- or moisture-pores often give the interior of the stone a porous appearance, and they also give rise to clouding.

In purchasing a diamond the buyer should always use a ten- or twenty-power microscope, to make sure that he is getting a stone as

represented. Jewelers usually classify diamonds as first, second or third *water*. In the first class are those which are colorless and transparent and without flaws of any kind; in the second class, those which are colorless with small but unimportant defects, or faultless but with some traces of color; in the third, those which are distinctly colored, or colorless with serious faults. Stones of the first water may be perfectly colorless or they may have a tinge of blue, and they are carried only by first-class jewelers. Second-class diamonds often show traces of yellow color, which may readily be seen when the stone is examined in the sunlight. E.S.

For a further study of the subject the reader is referred to the following works: Kunz's *Gems and Precious Stones;* Streeter's *The Great Diamonds of the World;* Williams' *Diamond Mines of South Africa;* Claremont's *The Mineral Industry* (Volume VII).

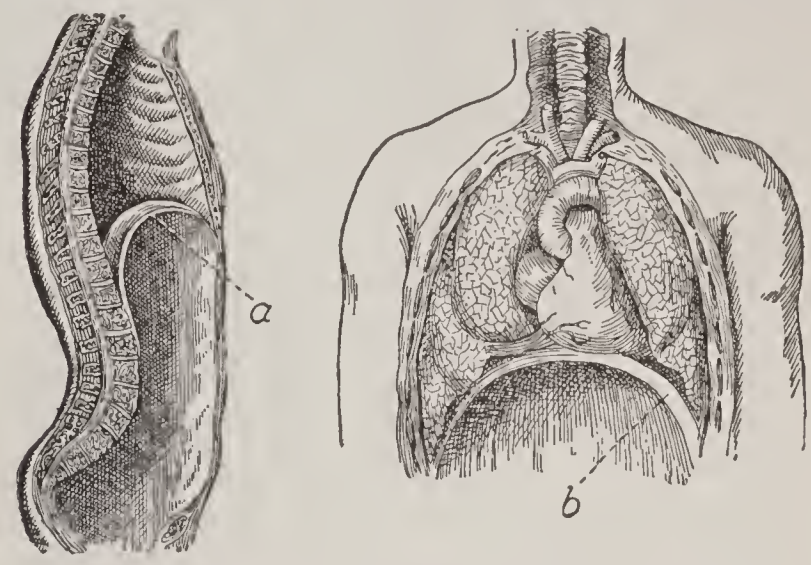
DIANA, *di an'a,* or **ARTEMIS,** *ahr'te mis,* in classic mythology the daughter of Jupiter and Leto (or Latona), and the twin sister of Apollo. She is best known as the goddess of hunting, and is most frequently represented with bow and arrows, a quiver on her shoulder, a crescent on her head and attended by hounds. She was brave in warfare and merciless in anger. Diana was identified with the Isis of the Egyptians.

DIANA

Familiarly known as the "Diana of Versailles," because for many years it was in the Palace at Versailles. It is now in the Louvre, Paris. The statue is believed to have been the work of the sculptor Leochares, who lived in the fourth century B. C.

Temple of Diana, a magnificent edifice, probably completed about 400 B. C., in Ephesus, Asia Minor, and dedicated to the worship of Diana as the goddess of fruitful nature. It was built of Parian marble, was of imposing dimensions and was considered one of the wonders of the world. It occupied the site of many previous temples which had been destroyed, one of them by the Ephesian Herostratus in 356 B. C. In A. D. 262 it was sacked and burned by the Goths, but later was partially restored. Excavations made in 1867, and subsequently, disclosed the lost site of the temple and many interesting and important details regarding it.

DIAPHRAGM, *di'a fram,* the large, muscular partition which separates the cavity of the chest from that of the abdomen. The diaphragm bends upward; its upper surface is



TWO VIEWS OF THE DIAPHRAGM

(*a*) Vertical section of trunk, showing cavities of thorax and abdomen separated by the diaphragm; (*b*) the diaphragm is shown, front view.

convex and its lower, concave. It is the chief muscle in respiration (see BREATH), and when it moves downward, it presses upon the stomach and causes a pressure to bear upon all the digestive organs of the abdomen. In this way it exerts some influence over the movement of the contents of the intestines. Sudden contraction of the diaphragm results in hiccoughs.

Mammals, or milk-giving animals, are the only organisms having complete diaphragms.

The name is derived from a Greek word meaning *to fence* or *enclose*. See ABDOMEN.

DIAS, *de'ahsh,* BARTHOLOMEU (? -1500), a Portuguese navigator celebrated for his discovery of the Cape of Good Hope. In 1487, after several voyages to that part of Western Africa now known as the Gold Coast, he was placed in charge of an expedition to explore the African coast farther south. Being carried by the winds out of his course, he rounded the Cape of Good Hope without sighting it and anchored in Mossel Bay, in Cape Colony. He was compelled to turn back by the complaints of his men, and on the return voyage he located Cape Agulhas, the southernmost point of Africa. A little later he discovered Table Mountain and the cape, which he named the Cape of Storms; the king of Portugal changed the name to Cape of Good Hope. Dias perished in a storm which wrecked his vessel while he was returning from a voyage to Brazil.

DI'ATOM, a little, brown, one-celled plant which grows in either salt or fresh water, and which has often been mistaken for an animal because of its peculiar movement in the water. There are several thousand species, growing in jellylike masses in large numbers among the green algae (which see). These serve as the food for small animal forms, which in turn are food for fish. The shells of the diatoms are composed of silica, which will not dissolve in water, and consequently large masses are deposited at the bottom of seas, lakes and ponds. At Richmond, Va., is a deposit many feet in thickness. Such deposits are used as polishing powder and as the absorbent of nitroglycerine in the manufacture of dynamite.

DIAZ, *de'ahz,* Porfirio (1830-1915), a Mexican soldier and statesman, who after a lifetime in the service of his country, including more than thirty years as President of the republic, died an exile in a foreign land.

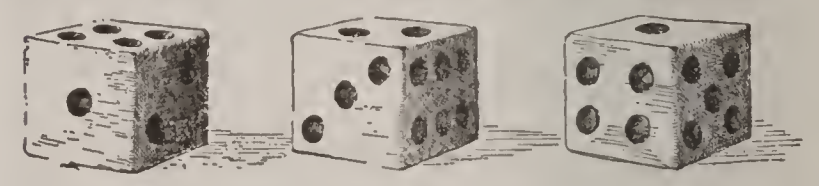
PORFIRIO DIAZ
Thirty years of peace and progress in Mexico ended with his exile to Spain in 1912.

For a time he studied law, but at the outbreak of war with the United States in 1846 he entered the army and began a military career which won him a reputation for skill and courage. He took a prominent part in the factional fights which disturbed Mexico for a number of years after the war, proving a most efficient leader of the patriots during Napoleon III's attempt to found an empire under French control. It was under his command that Pueblo and the City of Mexico were taken in 1867.

After starting several revolts in an effort to secure the Presidency he was elected to that office in 1877, through sheer force of arms. He soon proved his exceptional ability, and when, during the Presidency of General Gonzalez, it was proved that Diaz was the better man for the office, the constitution was changed so that he might continue in office as long as the people desired it. He won the confidence of his own people, and of those of foreign countries. Under his guidance trade and industries were extended, the tariff law was revised, finances were improved and important lines of railway were established.

Although there was occasional opposition to Diaz, it was not powerful enough for many years to accomplish his overthrow, for it must be admitted he ruled by the power of his army. In 1912, however, a revolution headed by General Madero resulted in the resignation of Diaz. He fled to Continental Europe, and from that point of safety followed with anguish the record his unhappy country made in the years of civil strife which started with the murder of Madero. He died in Paris. See Mexico, subtitle *History.*

DICE, cubes of ivory, bone, wood or other material used in gambling games continuously since their invention about 1244 B. C. Dots from one to six in number are placed on all six faces of the cube, so arranged that the



DICE

total of any two opposite faces is always seven. The dice are placed in a cylindrical box, shaken, and then thrown upon a flat surface. The numbers showing on the top face form the basis for deciding the game. The highest total of the numbers showing may win, or the dice may be used in the same manner that cards count in a poker hand. Dice games are regarded as such pernicious forms of gambling that they are forbidden by law in many states and in many parts of Canada. The particular objection to dice is that play is entirely governed by chance, allowing no considerations of skill. "Loaded dice" are frequently employed by dishonest players, the sides opposite the highest numbers being so weighted with lead that "high" naturally falls uppermost when the dice fall from the box.

DICKCISSEL, a popular name for the black-throated bunting, in imitation of its loud, persistent call. It is a handsome bird, rather larger than a sparrow; the back and body are dark above and yellow below. There is a bright chestnut patch on each wing; the throat is white, and across the breast is a black crescent band. Earnestly calling from roadside fence, from weed-stalk or in the grass, it is a bird whose song is common in the open regions of Central United States and is occasionally heard in Southern Ontario. It feeds on eggs of insects, seeds and gravel and also relishes the destructive cankerworm. It is therefore a friend of the farmer.

DICKENS, CHARLES (1812-1870), one of the greatest of English novelists and an educational reformer. His works enjoyed in his own day a popularity unmatched in literary history, and they have continued to give constant exquisite pleasure to millions of readers. He was a creator who brought into life almost countless characters as real as the people who walk the streets, and more real to the minds of his readers than the characters described by historians. He made his characters represent activities in the development of great and much-needed social, educational and industrial reforms. Then, too, he possessed a genuine love for men, a grasp of the humorous and absurd and a knowledge of life among the lower classes which are certain to make him live long after more finished writers have lost their hold on the public.

Early Years. This man whom royalty delighted to honor in his later years had an unhappy and almost sordid youth. At his birth, on February 7, 1812, at Landport, Portsmouth, his family was in fairly-easy circumstances; they remained so for a time after their removal to Chatham, and finally, in 1821, to London. But the "prodigal father," as Dickens called his parent years later, was a careless, happy-go-lucky man, who at length became so deeply in debt that he was sent to a debtor's prison, the Marshalsea, afterward made famous by Dickens in *Little Dorrit.* Since a man in a debtor's prison might make himself very comfortable if he had a little ready money, it is probable that Charles' father had a better time than did Charles, who had been put to work in a blacking warehouse. All day he worked very hard and had but the scantiest food, but he could have borne all that had it not seemed to him that he had come to the end of his dreams of an education and a useful, busy life. For little Charles was very ambitious, and he had determined that somehow he was to become a great man. It was far from his thoughts that the very experiences he was going through, the very people he was meeting in his unattractive surroundings and storing up in his marvelous memory, would some day be the means of making him great.

After about a year this wretched life came to an end, and Dickens was able to go to school for two years, after which he entered a lawyer's office. In this position he was little more than an office boy, but he had time to study, and came into contact with people who saw that he was not an ordinary boy. In his spare hours he studied shorthand, and at the age of nineteen became a newspaper reporter in the House of Commons. A little later he began to contribute to the *Monthly Magazine* and the *Evening Chronicle* those sketches of London life known as the *Sketches by Boz.* So popular were these that publishers bargained for a new series, and in 1836 *Pickwick Papers* began to appear in monthly numbers. It is difficult to realize the excitement which this loosely-woven sketch, with its world-famous Sam Weller, aroused; and the great popularity they won for their author never declined through all the rest of Dickens' life. It was in 1836, too, that he was married to Miss Catherine Hogarth.

His Busy Years. With *Oliver Twist,* his next work, he introduced a new feature—that satire of institutions which actually accomplished results in more than one field. In *Oliver Twist* it was the abuses of the workhouse system that were exposed; in *Nicholas Nickleby,* the management of the cheap boarding schools; and that Dickens was not hitting beside the mark may be seen from the fact that more than one schoolmaster threatened to sue him for libel, believing himself the man caricatured in the coarse and brutal Squeers. Years later *Bleak House* protested against the interminable suits in chancery, and *Little Dorrit* against the evils of the debtor's prison system.

Meanwhile, in the weekly "Master Humphrey's Clock," had appeared *The Old Curiosity Shop,* with its paragon of children, Little Nell,

and its inimitable Dick Swiveller; and *Barnaby Rudge,* his only historical novel with the exception of *A Tale of Two Cities.* This latter gives a vivid picture of the period of the French Revolution, and the "knitting women" are not soon forgotten. Sidney Carton, the hero, is perhaps the most heroic of all

CHARLES DICKENS

Of his boyhood one authority (Long) says that he was "a poor, obscure and suffering child, helping to support a shiftless family by pasting labels on blacking bottles, sleeping under a counter like a homeless cat, and once a week timidly approaching the big prison where his father was confined for debt."

Dickens' characters, and the story as a whole is his most dramatic and artistic work. Dramatized as *The Only Way,* the *Tale* has been very popular. Other outstanding novels are *Martin Chuzzlewit,* which contains in overflowing measure Dickens' characteristic humor, but which for a time stirred up considerable feeling against him in America because of its satire on life in "Eden"; *Dombey and Son,* beloved by many because of its pathetic little Paul Dombey, and admired by progressive thinkers because of its revelation of the evils of cramming in schools; *Hard Times,* a bitter attack on the heartlessness of capital toward labor, and a most complete criticism of adulthood for robbing children of a real childhood and for preventing the development of the imagination of each child; *Great Expectations,* Dickens' best-rounded work; *Our Mutual Friend* and *David Copperfield.*

This last-named story was Dickens' favorite among his own works, and contained more that is autobiographical than all the rest together. Mr. Micawber is a sketch, exaggerated, but good-naturedly so, of Dickens' father, and the agonies of little David during his warehouse experiences are those of Dickens' self, remembered so keenly that they were a pain to him all his life. One novel, *The Mystery of Edwin Drood,* he left unfinished at his death, and it is a curious fact that while in most of Dickens' stories he cannot keep a secret but reveals the windings of his plot at every turn, in this unfinished one he kept his secret so well that no one has ever been able to complete the tale satisfactorily.

During the latter years of his life Dickens added to his immense popularity by giving readings from his own works, and his *Letters* describe most amusingly the crowds that flocked to hear him. All this was too much for his strength, however, and he died at the age of fifty-eight, at his home, Gadshill, near Rochester. Mourning for him was widespread, and the public which had loved him as though he had been a personal friend felt that he should be buried in *Westminster Abbey,* rather than at Rochester, as he had desired. Accordingly, he lies in the Poets' Corner there.

American Visits. The United States and Canada knew Dickens not only through his works but through several visits to America. The first was in 1842, and was turned by the enthusiastic people into a sort of triumphal progress. Everywhere great crowds awaited him, until he confessed himself hungry for solitude; everywhere he was feasted and flattered, and though his frankness on the subject of international copyright and his unfavorable comments on the country and its self-conscious republicanism, as written in *American Notes* and *Martin Chuzzlewit,* later brought about much criticism of him, the American people enjoyed his works too much to hold a grudge. When he made his next visit, in 1867, every hall in which he gave his readings was packed to its capacity.

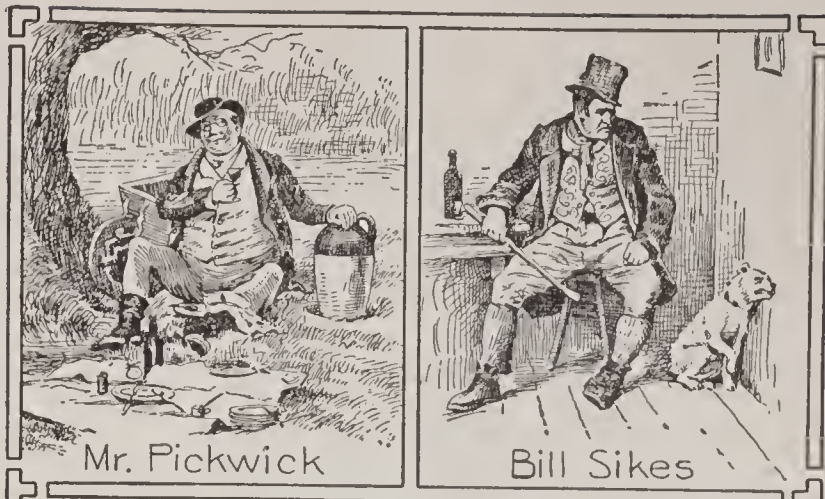
Influence on Education. Dickens never taught school, nor did he outline a system of education; he never wrote a learned book on "child-training" or "defects in modern education," yet educators of note declare him to have been the greatest educational reformer England has ever produced. Not only did specific abuses yield to his attacks, but the general spirit of education in England and the very attitude toward the child changed

slowly until they came more into accord with his ideas; and his ideas were largely those of the highest authorities to-day. Argumentative treatises were not in his line—he knew a better way to attack abuses. The evils of corporal punishment made a strong impression on him, for he had gone to school enough in his own young days to know what they were; so he wrote *Nicholas Nickleby* and drew in it a picture of monster Squeers, almost too vicious to be real, but too convincing not to be; he wrote

GADSHILL

David Copperfield, and let his readers feel the bite of Mr. Creakle's cane as he cut at the "chubby boys" whom he couldn't resist. These things and many, many more he described, with the result that thinking men all over the country began to wonder whether such abuses really existed, and if they did, to resolve that they must be corrected. To-day "Not one blow in a thousand is given to a child as compared with the time of Dickens' childhood," and of this improved state of things Dickens was not only the prophet but in a large measure the promoter.

He saw other evils, too. That of "cramming" struck him as particularly serious, and he wrote with satire as biting as it was interesting of the "mental green peas," "intellectual asparagus" and "mathematical gooseberries" that were "common at untimely seasons under Doctor Blimber's cultivation." The unwholesome restraint of children, the systematic ignoring of their individuality, the unsympathetic attitude that was adopted toward them—all these and more he attacked and at least partially vanquished. Of course not every school had all these evils, but many of the private institutions made them a regular part of their system, and parents as well as schoolmasters were likely to fall into the error of looking upon childhood as a troublesome time which



DICKENS PROGRAMS

1.

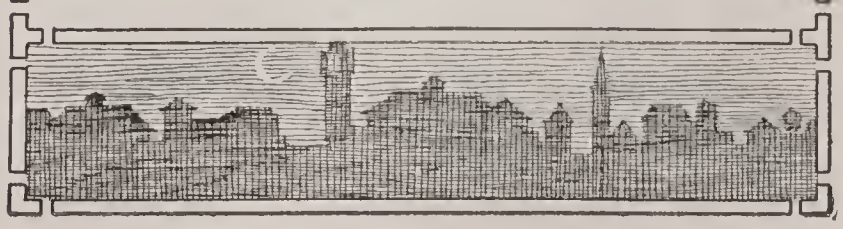
"No one thinks first of Dickens as a writer. He is at once, through his books, a friend."

Song, *The Ivy Green*.....*Dickens*
Essay, *The Childhood of Dickens*
Mrs. Jarley's Wax Works, from *The Old Curiosity Shop*
One child may represent Little Nell, and act as showman; others may be the various "wax works."
Character sketch, *Little Nell*
Essay, *How Dickens' Novels Differ from Those of George Eliot*
Reading, *A Child's Dream of a Star*.. .....*Dickens*
Essay, *What Dickens Thought of America*
Sources: *American Notes* and *Martin Chuzzlewit*
Dramatization, *Sam Weller Writes a Valentine*
Characters: Sam Weller and his father

2.

The chief work of Dickens was to lay bare the injustice, the meanness, and the blighting coercion practiced on helpless children. . . . . His was a noble work, and it was well done. *Hughes.*

Dickens in Camp.....*Bret Harte*
Essay, *How Dickens Advanced Education*
Dramatization, *David and Little Em'ly*
Scenes from *David Copperfield*
Essay, *How Dickens' Novels Differ from Those of Thackeray*
Reading from *Dombey and Son,* conversation about the waves, between Paul and Florence.
Song, *What Are the Wild Waves Saying*.....*Carpenter*
Character sketch, *Paul Dombey*
Dramatization, *David Meets His Aunt*
Characters: David, Betsy Trotwood, Mr. Dick
Reading, *The Pickwick Club on the Ice*



must be undergone but which should be sternly repressed so far as possible. Gradually, through his many books with their wide sale, Dickens made more and more general his own attitude toward children, which was one not of toleration but of sympathy and alert interest. Some of his ideas are commonplace to-day, but in his time they were in advance of the age, and the benefit which they conferred on children it is impossible to estimate.

Summary. One cannot read the novels of Dickens and make the acquaintance of their wonderful characters—of Sam Weller and his father, of Mrs. Gamp, Mr. Mantalini, Mr. Toots, the Marchioness and Dick Swiveller—without realizing what a delightful companion their creator must have been. To have taken a walk with him about London must have been an enlightening experience, for he possessed the ability instantly to see absurdities, incongruities, queer sidelights on human characters which another might miss, yet could not fail to appreciate once they were pointed out. And it seems most natural to find that Dickens was deeply loved by his friends, to whom he in his turn was devoted. He took an intense interest in everything connected with the theater, and delighted to take part in private theatricals, either for his children's amusement, for charity, or for the pure pleasure of doing a thing which he did very well. His dramatic ability was so pronounced that an old attendant at one of the theaters once said to him, "Oh, Mr. Dickens, if it hadn't been for them books, what an actor you would have made!"

For a time, about twenty years after his death, Dickens was somewhat underrated, and there are not lacking to-day those who think that his books will some day be so "out of date" that they will lose their popularity; but the weight of opinion is all on the other side. Most authorities hold that Dickens' fame will increase rather than diminish, and there are some who do not hesitate to declare that in generations to come he will stand out as the greatest creative genius that England has produced. Count Tolstoi strongly held to this view. He kept but one picture on the wall in his room, and that was a portrait of Dickens. It is a fact that in 1915 his books were selling more widely than ever before. J.L.H.

Those who are sufficiently interested in Dickens to wish to study his life will find Forster's *Life of Dickens* most satisfactory, while Dickens' own *Letters* afford much information and are as delightful as one of his novels. G. K. Chesterton has written a most appreciative *Critical Study*, and James L. Hughes has published *Dickens as an Educator*. For assistance in writing a biography of Dickens, see BIOGRAPHY, page 724.

DICKSON CITY, PA., a borough of Lackawanna County, in the northeastern part of the state, four miles north of Scranton and 166 miles north and west of Philadelphia. It is on the Delaware & Hudson and the New York, Ontario & Western railroads. Electric interurban lines extend to Scranton and other towns. Dickson City is in the largest anthracite coal region in the United States. There are several mine openings within the limits of the borough and coal mining and shipping is the principal industry. There are also foundries, machine shops and silk mills. The population, which was 9,331 in 1910, had increased to 11,049 in 1920. The area of the borough is three square miles.

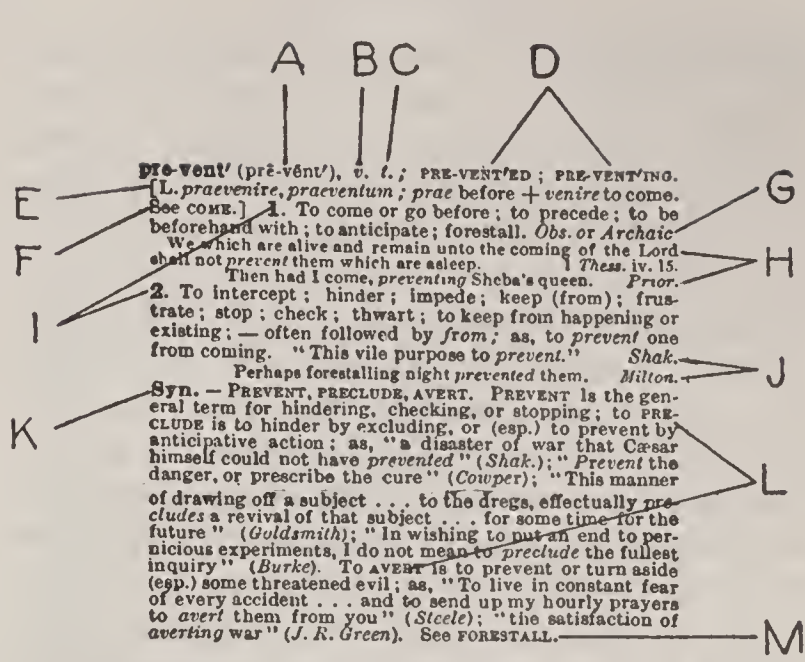
DICOTYLEDON, *dī kot e lē' dun.* See subhead, under COTYLEDON.

DICTATOR, *dik' ta tur,* a magistrate of the Roman Republic who was elected only in case of great national emergency, and to whom supreme power was given. He could hold office for six months, but was eligible to reëlection if the emergency yet existed. When it was found necessary to place a man at the head of affairs the Senate appointed one consul to make the selection. The dictator had power of life and death, without appeal to people or to the Senate, but could not leave Italy and had no control over the treasury. Julius Caesar was on three occasions appointed dictator, the last appointment being for life. Cincinnatus left his plough to become dictator, returning to his farm when he had saved the republic. In 82 B.C. Sulla was elected to the office and contrived to get himself reëlected again and again, holding the office for three years. After the death of Julius Caesar the office was abolished. See CINCINNATUS.

DICTIONARY, *dik' shun a ri,* from a Latin term meaning *word,* means literally a *word-book.* As commonly used, it means a book which contains in alphabetical order all or part of the words of a language, with definitions, pronunciation and examples showing their use, and with frequent illustrations. To a grown person it seems a very simple matter to find a word in a dictionary, but it is not a faculty which comes naturally to children; often the use of a dictionary is one of the difficult things which a teacher must teach. Boys and girls have ability to use correctly only a few hundred words, while their fathers and mothers may not

have a vocabulary exceeding 2,000 words. Therefore a dictionary, which may define from 100,000 to 400,000 words, is a necessity in every household.

Children should be able, before they leave the fifth grade, to look up a word quickly, to discover its pronunciation and to pick out its various meanings; this they can best accomplish in some of the smaller, more simple dictionaries. But the older children should be taught to use a complete, or unabridged, dictionary and to appreciate the wealth of information to be found there. The difference in the amount of knowledge which two people can glean from a given paragraph in a dictionary may be very enlightening. One will find only the meaning of the word sought, and perhaps not the very best meaning for his purpose; another will discover fact upon fact—word forms, obscure or old meanings, apt quotations and a tracing of derivations which is a veritable word-romance. There is given herewith an illustration, explaining all that is said in a certain standard dictionary about a common word; and by means of guide letters the varied character of the information is pointed out. Some words call for less explanation and illustration and some for far more; this is a fair average.



GETTING INFORMATION FROM A DICTIONARY

A. The dictionary gives the pronunciation of a word. Almost always a list of well-known words is given at the bottom of the page to make clear the method of marking pronunciation.

B. It tells the part of speech of the word.

C. In the case of a verb, the dictionary tells whether it is transitive or intransitive—that is, whether it may or may not take an object.

D. It gives the principal parts.

E. It indicates the language and the word or words from which the word under discussion is derived. For added clearness, it shows the make-up of the source word.

F. It refers to other words which are related in meaning.

G. If certain meanings of the word have passed or are passing out of use, the dictionary makes clear that fact by the use of the abbreviation *Obs.* (Obsolete) or the word *Archaic.*

H. In some cases it gives quotations from well-known sources to show in what period the word was in use in its now obsolete sense.

I. It lists the various meanings of a word under different numbers.

J. It illustrates the correct method of using a word by showing how some writer of good English has employed it.

K. It gives a list of synonyms—that is, of words which mean the same or nearly the same.

L. By means of further definitions and carefully chosen illustrations, it points out just the shades of difference between these similar words.

M. It refers to other words under which related information is given.

The large school or library dictionaries also contain much other matter besides word definitions. Lists of geographical and biographical terms, with brief explanations; much-used terms from foreign languages; national flags, state seals—all this and more is to be found in the various appendices. The pictures should not be neglected; they are inserted not for ornament but to make the text clearer, and in many instances have been drawn by high authorities in the subjects which they portray.

History of Dictionaries. The dictionary is far from being a modern invention, for the Assyrians had one of their language over 2,500 years ago, pressed in cuneiform characters on clay tablets (see CUNEIFORM INSCRIPTIONS). The Arabians, the Greeks and the Romans, too, compiled dictionaries; they did not make any attempt at giving all the words of a language, but contented themselves with listing rare or difficult words. During the Middle Ages, when an ever-growing interest in Greek and Latin literature was felt, there arose the need for *lexicons*—dictionaries which define the words of one language in terms of another—and with the increased intercourse between peoples this need has become even stronger. To-day there are lexicons which make almost every language on the globe, and many dialects, available to English students.

Of English dictionaries which aimed at completeness the first was that of Nathan Bailey, published in 1721 and called the *Universal Etymological English Dictionary.* The English dictionary of Samuel Johnson, published in 1755, marked an epoch in the history of the English language and created a stir which it is difficult for the present age, rich in dictionaries, to understand. A dictionary is the last place in which one would expect to find humor, yet Johnson introduced it, consciously or unconsciously, into his. Oats, for instance, he declared to be "a grain which in Scotland forms the main subsistence of the people, but which in England is fed to horses." It was Johnson who introduced the practice, now well-

nigh universal, of illustrating the use of words by quotations from various authors.

Other dictionaries of the English language are that of Noah Webster, published in America in 1828, revised frequently and extensively, and still, as *The New International Dictionary,* a standard work containing over 400,000 defined words; Worcester's *Dictionary of the English Language; The Standard Dictionary;* and *The Century Dictionary;* the last-named is a combination, to a certain extent, of dictionary and encyclopedia features. Perhaps the greatest of all dictionaries is the *New English Dictionary,* begun in 1884 and completed in 1915. This is known popularly as the *Oxford Dictionary,* and is published at Oxford University. Its quotations are unusually full and illuminating and are arranged chronologically, while its study of word-history traces every word through all its changes and modifications. See LANGUAGE; ENGLISH LANGUAGE. A.MC C.

DICTOGRAPH, *dik'to graf,* an instrument made on the same principle as the telephone, but with an attachment that greatly increases the volume of sound at the receiving end. Since 1912, when it was perfected, it has been extensively used as a means of detecting or preventing crime. It is so small as to be inconspicuous and can be installed in a room without anyone's being aware of its presence. The fine connecting wires may be carried to any desired place and a person stationed at the receiver can hear conversation, even loud whispers, carried on in the room containing the transmitter.

DICTOPHONE, *dik'to fone,* an incorrect name for the dictograph (see above).

DIDACTIC, *di dak'tik,* **POETRY,** that kind of verse produced by a poet when his chief object is to instruct or impart information.

The *Georgics* of Vergil and Horace's *Art of Poetry* are classic examples of didactic poetry, the former being an account of agriculture and kindred arts, and the latter a discussion of the principles of poetry. Pope's *Essay on Criticism* and his *Essay on Man* are among the best-known didactic poems in English literature. The familiar couplet which follows is an admirable illustration of this type of verse:

> Know then thyself, presume not God to scan;
> The proper study of mankind is man.

Longfellow's *A Psalm of Life* may be considered an example of a short didactic poem.

The exact nature and purpose of poetry is a matter of dispute. Some critics, those of the Edgar Allan Poe class, tell us that the function of poetry is to give pleasure, and that Pope's *Essay on Man* cannot properly be called poetry. A medium ground is taken by those who claim that the highest forms of poetry teach important lessons of life without being purposely didactic. Milton's *Paradise Lost,* Goethe's *Faust* and Shakespeare's dramas all contain valuable ethical teachings, but these spring from the very heart of the masterpieces, which are in no sense examples of didactic verse.

DI'DO, or **ELIS'SA,** founder and queen of Carthage, was the daughter of a king of Tyre, called variously Belus, Agenor and Mutgo. She was the wife of Acerbas. Her brother Pygmalion, coveting her husband's possessions,

AENEAS AT THE COURT OF DIDO
From the painting by Guerin.

murdered him. Dido, concealing her wealth, and accompanied by many devoted people of Tyre, fled to Africa. She landed near Utica, a colony of Tyre, where she was promised as much land as might lie within the boundaries of a bull's hide. Cutting a hide into many thin strips, she pieced them together, and thus secured an extensive territory. Here she built Carthage. Iarbas, a neighboring prince, wished to marry her, threatening war if she refused. Hating and fearing him, she erected a funeral pile, threw herself upon it and stabbed herself in the presence of her subjects. Vergil gives a different version of this episode, attributing Dido's suicide to her love for and abandonment by Aeneas, a Trojan hero (see AENEAS). Dido was worshipped in Carthage as a goddess.

DIE, a tool used for stamping metals and leather. The design to be stamped is engraved on the die, which is usually made of high-quality steel. Coins are stamped on both sides at once by using two dies. Some dies are made for use by hand, but machinery is generally employed for stamping metals.

Die Sinking. The making of dies, called die sinking, is an industry requiring great skill. The die sinker first makes a pencil tracing of the design he is to reproduce. The surface of the metal employed is coated with white paste, on which the tracing of the design is pressed. Gentle rubbing of the back of the tracing causes the lines to be transferred to the surface of the metal. The lines are then cut to the required depth with sharp steel tools. From the original die, which is hardened and tempered, any number of copies may be made by stamping or punching in a softer metal, which is then hardened for use.

DIELECTRIC, *di e lek' trik,* the name generally given a non-conductor of electricity, such as the glass between the outside and inside coating of a Leyden jar (which see). In other words, a dielectric is an *insulator;* the term is particularly applied to a non-conductor placed between two good conductors of electricity. In the practical use of electricity mica and paraffin paper are extensively used as non-conductors. See ELECTRICITY; INSULATOR.

DI'ET. This word is derived through the French and Latin languages from the Greek *diaita,* which means *manner of living.* In the English language, however, the meaning is confined to one item of the manner of living, namely, the food. The food which one takes regularly is one's *diet.* Very often a person suffering from disease is "put on a diet"; that is to say, the physician prescribes the nature of the foods to be taken, and sometimes the quantities of each. Soldiers and sailors are issued a certain ration, that is, allowance of foods. If a soldier uses his whole ration, that ration constitutes his diet. The diet of a healthy person must be such as to maintain the health. It must contain sufficient of the proteins to make good the waste of protein that is inseparable from the life-processes of the body. It must also contain sufficient fuel material to maintain the body temperature and to provide energy for all the motions of the body. It must include sufficient water to make up for the water eliminated from the body through the lungs, skin and kidneys; and, finally, it must contain sufficient of each of the minor constituents of foods for its peculiar functions.

Under the title FOOD in these volumes will be found a classification of the substances found in foods and a table showing the composition and fuel value of some common foods. In the same article the influences of sex, age, occupation and climate upon the food requirements are discussed. The following is an estimate of the daily food requirements of a man of average weight (150 pounds) doing an average amount of work:

Proteins, four ounces; fats, three ounces; carbohydrates (sugars and starches), fourteen ounces; water, four quarts.

Such a diet would have a fuel value of 2,850 calories (see CALORIE). These requirements would be met by the following selection of foods (but it must be borne in mind that many other combinations of foods could be made which would also conform to the same standard):

One pound bread, one-half ounce butter, three-ounces oatmeal (dry weight), one and one-half pints milk, four ounces roast beef and two ounces sugar.

In armies and navies, and in prisons, hospitals for the insane and other institutions where large numbers of people have to be fed regularly, the *dietary* has to be carefully worked out so as to provide enough food for each person and enough of each food substance, and at the same time to keep the cost as low as possible. The branch of hygiene and medicine which treats of diets in their relation to health and disease is called *dietetics.* J.F.S.

Related Subjects. The reader is referred to the following articles in these volumes:

Carbohydrates	Food
Digestion	Protein
Fats	

DIET, the name applied to the Hungarian Parliament and to the legislative assemblies of German states and Austrian provinces. In the days of the Holy Roman Empire the name was given to the imperial Parliament. The word also refers to a formal public assembly, popularly applied in Europe for many years to religious assemblies for special purposes. In 1521 Martin Luther was brought before the Diet of Worms for inquiry into what were considered his heretical views.

DIFFRACTION, *dif frak' shun.* If the edges of two knife blades are placed together and held up to the light one can see rainbow tints through them. If a small round hole is made in the shutter to a dark room and the rays of light forcing through it are allowed to fall on a screen, an image of the sun surrounded by rainbow tints will be seen. A slit in a window shade will produce a similar effect. This play of colors is also seen in the mother-of-pearl

and on the plumage of some birds. It is called diffraction of light, a term which means *breaking away from.* Diffraction is caused by interference with the waves of light. See LIGHT.

A plate of glass prepared for the purpose and ruled with at least 2,000 lines to the inch exhibits a beautiful play of colors. Such a plate is known as a *diffraction screen.* It may be made by ruling on glass covered with gold leaf or a coating of India ink and glue. A study of diffraction led to the invention of the spectroscope (which see), and it has also been of great assistance in the study of the spectrum. See SPECTRUM ANALYSIS.

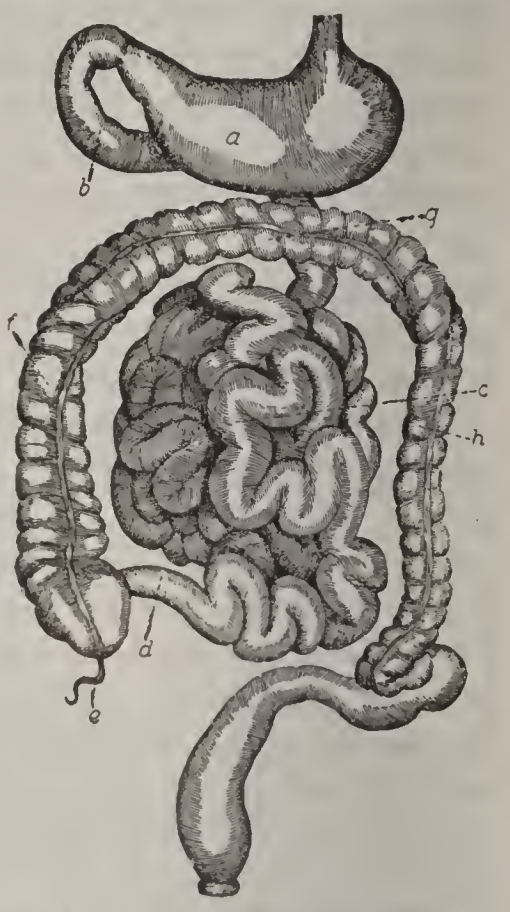
DIFFUSION, *di fu' zhun,* is the mixing of two fluids when brought in contact. Fill a glass fruit jar two-thirds full of water, then by means of a pipe inject to the bottom of the jar a little red ink. Within a short time all the water will have a red tint; this thorough mixing is *diffusion.* A dark-colored syrup can be used in place of the ink, but it will act more slowly. Gases diffuse more rapidly than liquids. Were it not for diffusion the different gases in the atmosphere would arrange themselves in layers; the carbon dioxide, or carbonic acid gas, which is the heaviest, would be at the bottom, the oxygen would be next, and the nitrogen would be at the top. See AIR.

Diffusion of gases is easily illustrated in a chemical laboratory by the following experiment: Fill one flask with chlorine gas and another with hydrogen, taking care to close the mouth of each jar so no gas can escape. Then connect the jars by means of a glass tube so that the jar containing hydrogen will be inverted over that containing chlorine. Although the hydrogen is much the lighter, some of it will descend to the lower jar, and some of the chlorine will rise to the upper jar. The change would take place even through a thin plug of plaster of Paris.

DIGESTION, *di jes' chun.* The food which is taken into the mouth, however well cooked and palatable it may be, is not in such condition that it may be absorbed at once by the blood and used to nourish the body. Various changes must take place, some in the mouth, some in the stomach, and some in the intestines. The process by which these changes are brought about is known as *digestion.*

The Mouth. Digestion begins in the mouth, where the food is ground into fine particles by mastication and mingled with *saliva,* which moistens it and changes some of the starch to *maltose.* Thus thorough mastication serves a two-fold purpose; it mixes saliva with the food and grinds the latter so the fluids of the stomach and intestines can more readily act upon it. When mastication is not thorough there results *indigestion,* or failure of digestion.

The Stomach. The masticated food passes down the æsophagus into the stomach, where further changes take place. The gastric juice is mingled with the food by a peculiar churning motion, caused by the contraction of the muscles of the stomach. The gastric juice starts the digestion of the *proteins,* or nitrogen-bearing foods, such as eggs, lean meat and milk. A ferment called *rennin* curdles the milk and aids in its digestion. The starches, sugars and fats are not changed by the gastric juice. The time required for digestion in the stomach varies from two to four hours, according to the nature of the food. The partially digested food, known as chyme, passes on into the intestines.



CHANNEL OF DIGESTION

Below the mouth, the processes of digestion are related to the following organs:

(*a*) Stomach
(*b*) Duodenum
(*c*) Small intestine
(*d*) Termination of the ileum
(*e*) Vermiform appendix (now obsolete)
(*f*) Ascending colon
(*g*) Transverse colon
(*h*) Descending colon

The Intestines. The last stage of digestion takes place in the small intestine. Here the bile and pancreatic juice are mingled with the chyme. These fluids act upon the fats, starches and proteins; the digestion of proteins is completed, and also that of starch, which is begun in the mouth. The fats are changed into a soapy substance. The intestinal juices complete the work of forming *chyle,* the fully digested food which is ready to be absorbed by the lymphatics and carried to the blood vessels. There is little or no digestion in the large intestine.

W.A.E.

Related Subjects. The following articles in these volumes bear a more or less close relation to the topic of digestion:

Absorption Alimentary Canal

Bile	Nutrition
Chyle	Pancreas
Chyme	Peptones
Fat	Proteins
Fletcherizing	Saliva
Gastric Juice	Starch
Health Habits	Starvation
Intestines	Stomach
Liver	Sugar
Mastication	Taste
Mouth	Teeth

DIGIT, *dij'it,* a word derived from the Latin *digitus,* meaning a *finger.* It is now applied to any one of the ten numerals from 0 to 9. A number of three figures, such as 134, is said to consist of three digits. See ADDITION; MULTIPLICATION; DIVISION.

In astronomy a digit is one-twelfth of the diameter of the sun or moon. In measuring an eclipse, if eight of the twelve divisions of the surface are covered, it is spoken of as an eclipse of eight digits.

DIGITALIS, *dij i ta'lis,* a genus of flowering plants, the most common of which is the foxglove, a native of Great Britain but now extensively cultivated in the United States and Canada. The word is Latin, and means *pertaining to a finger.* It is applied to these flowers because they bloom in finger-shaped tubes, or bells. The leaves of the plant are used in medicine, for they are specially valuable for their influence upon heart action and the circulation of the blood. The drugs extracted from the leaves are known by various names, such as *digitalis, digitoxin, digitonin* and *digitin.* They should never be administered except by a skilled physician, as their unwarranted use may lead to severe poisoning and sometimes to death. See FOXGLOVE.

DIJON, *de zhoN',* the capital of the French department of Côte d'Or, beautifully situated in a fertile valley at the junction of the Ouche and Luzon rivers, 195 miles southeast of Paris. It has important manufactures of woolen goods, hosiery, chemicals and paper, and is particularly noted for its production of mustard. There are also tanneries, iron foundries and cotton mills. The cathedral, a magnificent Gothic building dating from the thirteenth century, has a carved wooden spire 300 feet in height. The city is strongly fortified, according to beliefs entertained before the War of the Nations changed opinions as to defenses. Dijon was the stronghold of the dukes of Burgundy from the eleventh to the fifteenth century, but after the death of Charles the Bold in 1477 it was annexed to France. Population in 1921, 78,578.

DIKE. In the formation of the earth's crust molten rock was occasionally forced to the surface through crevices in stratified or igneous rock, the latter being rock formed by the action of heat. The molten rock cooled and became solid, forming a rock harder than that upon each side of it. Geologists have given the name *dike* to these formations, it being probably from a Greek word meaning *wall,* or *dam.* Dikes vary in thickness from a few inches to a hundred feet or more. The rock in them being harder than that on either side, the dikes in time form ridges as the surrounding rock is worn away, and large dikes often cause unevenness of surface. Dikes should be distinguished from *veins,* which sometimes contain ore.

Artificial embankments for the purpose of keeping a river in its channel or to protect lowlands from the sea are also called dikes, particularly in Europe. Holland has been reclaimed from the sea almost entirely by dikes, without which the North Sea would inundate the country (see NETHERLANDS, THE).

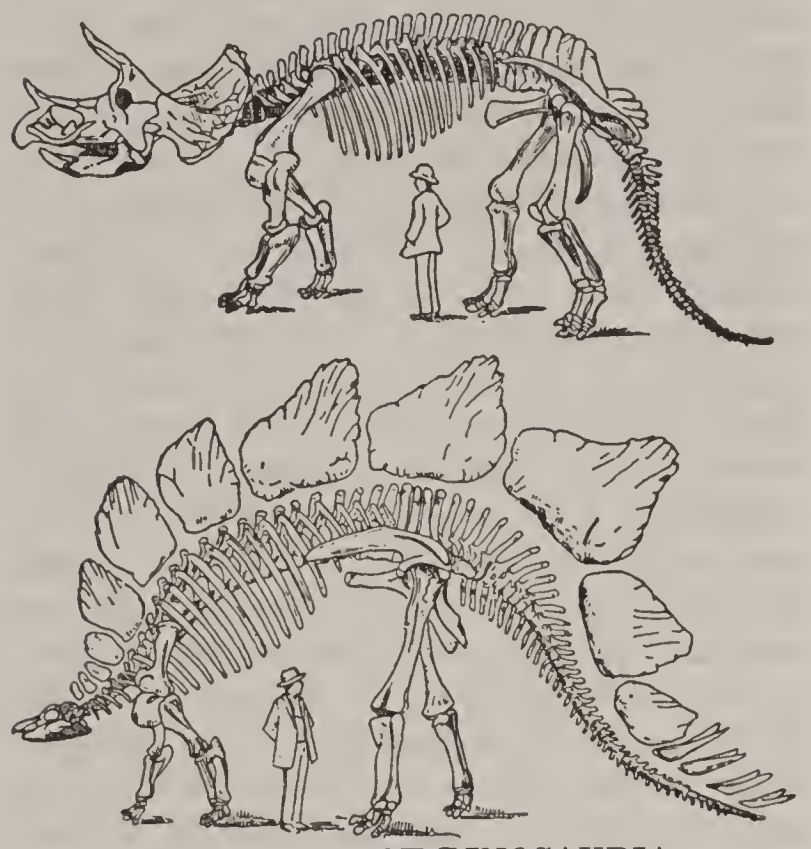
DILLON, JOHN (1851-), an Irish agitator and politician, from 1896 to 1899 the recognized leader of the Irish Nationalists. He was born and educated in Dublin, and entered Parliament as a member for Tipperary in 1880. He was twice imprisoned for inciting the Irish peasantry to violence, but stoutly held to his plans for freeing Ireland from English domination. Ill health caused him to remain out of Parliament for a few years, but he was reëlected in 1885, and has been regularly reëlected since. He visited the United States and Canada on several occasions and received encouragement from various Irish organizations.

DIMITY, *dim'i ti,* a dainty cotton fabric with a raised stripe or figure woven in the loom. It is used for summer dresses, curtains and covers in bedrooms, white being the common color. A heavier quality is often colored and used on furniture. The name comes from a Greek word meaning *made with a double thread.*

DINGO, *ding'go,* the name for the wild dog of Australia, remarkable as the only dog that exists both wild and domesticated in the same country. These wild dogs hunt in packs and are sometimes very destructive to herds of sheep, and on this account are fast being exterminated. In color the dingo ranges from tawny to almost black. It stands two feet high; its body is about two and one-half feet long, its hair is rough and coarse, and the tail

is long and bushy. In its wild state the dingo does not bark, its cry being a wolflike howl, but when associated with domestic dogs it learns to bark. If captured as a puppy and well treated, a dingo makes a faithful and affectionate companion and will valiantly defend its master's sheep against the attacks of its wild relatives.

DINOSAURIA, *di no saw' ri a,* a word derived from Greek words meaning *terrible lizard,* and now applied to a group of fossil reptiles whose remains are found in rocks of great age. They were apparently intermediate between lizards



SKELETONS OF DINOSAURIA

and birds; some ate vegetables, while others devoured other animals. The crocodiles of the present day were probably from the same original stock, though vastly inferior in size to the prehistoric reptiles. The *megalosaurus,* one of the largest species, attained a length of more than forty feet and was a flesh-eating reptile. The *diplodocus* was probably sixty feet in length, and according to expert calculations required about 500 pounds of vegetable food daily. The *iguanodon,* which was about twenty-five feet in length, also lived on a vegetable diet. The chief characteristic of most of these was the smallness of their heads in comparison with their enormous bodies. The brain development was very slight, indicating a very low order of intelligence. From fossil remains scientists have been able to reconstruct skeletons showing what these reptiles were in life. See Fossil.

DINWIDDIE, *din' wid i,* Robert (1690-1770), a colonial governor of Virginia who hastened the outbreak of the threatening French and Indian War. This was unintentionally accomplished by sending George Washington, in 1753, to the French commander with the demand that the French withdraw from Western Pennsylvania, where they were occupying land claimed by Virginia. In the war which followed Dinwiddie urged the colonies to help the English drive the French from the Ohio Valley, and he gave valuable aid to the expedition of 1755 sent against forts Duquesne, Niagara, Frontenac and Crown Point. He was continually quarreling with the colonial assembly, however, because of its reluctance to vote funds for carrying on the war; and his unpopularity was increased by his arrogance and miserliness. In 1758 he was recalled. See French and Indian Wars.

DIOCLETIAN, *di o kle' shan,* (A. D. 245-313), one of the emperors of Rome. He was of obscure parentage, but showed bravery and ability as a soldier, and the army in 284 raised him to the highest power. He introduced many reforms and installed Maximian, a rude, uncouth soldier, as his colleague. Two assistant emperors called *Caesars* were also appointed and were promised the imperial power in succession. Diocletian and Maximian resigned in 305, their places being taken by Constantius Chlorus and Galerius. The reign of Diocletian was marred by bitter persecution of Christians, the responsibility for which, however, rested mainly with Galerius.

The farmer who loves his life work above all else will understand the serenity of Diocletian's old age. Maximian took unkindly his forced abdication with Diocletian and sought to have the latter regain for the two the power they had lost. The old man replied, "Were you but to come to Salona and see the cabbages which I raise in my garden with my own hands, you would no longer talk to me of empire."

DIOGENES, *di oj' e neez* (412-323 B. C.), a famous philosopher of Athens, commonly called "the Cynic," because of his extreme and literal interpretation of the teachings of the Cynic school. He may be regarded as one of the earliest and most pronounced advocates of the simple life. The many stories told of his surly manners, his bitter humor and his mockery of his fellow citizens, while they do not represent his true character, are nevertheless suggestive of his independent, uncompromising nature. His father, a native of Sinope, in Asia Minor, was imprisoned for coining false money, and Diogenes went to Athens, where he became

a disciple of Antisthenes, founder of the Cynic philosophy. Though he was treated with great brutality, the pupil soon surpassed his master in learning and in the rigid asceticism of his life.

According to familiar tradition, Diogenes subsisted on the coarsest bread, slept at night in a tub, and even threw away his only drinking cup because he saw a boy drink out of the hollow of his hands. When he went about the city in broad daylight, carrying a lighted lantern which he thrust into the faces of passers-by, he said, in answer to inquiries, that he was searching for an honest man. He wore a long beard, and, like Socrates, walked the streets of Athens barefooted and clothed in a single garment.

DIOGENES
From the painting by Gérôme.

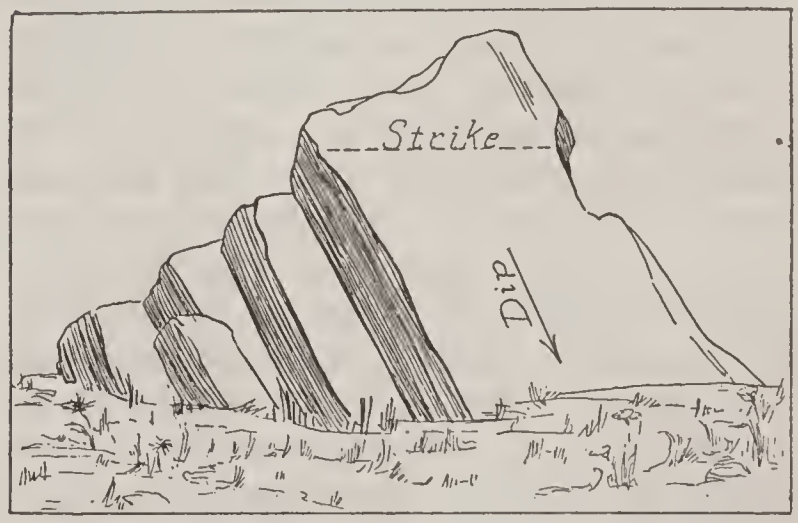
While on a voyage to Aegina, Diogenes was captured by pirates and sold as a slave. He informed his captors that he knew no trade except that of governing men and suggested that he should be sold to "a man who needs a master." As tutor to the sons of a wealthy Corinthian, he spent the rest of his life in Corinth, dying on the day on which Alexander the Great died in Babylon. In the city of Corinth the world conqueror and the philosopher had a famous interview. In the course of their conversation Alexander said, "How can I serve you, Diogenes?" "By standing out of the sunshine," was the Cynic's unexpected reply. So impressed was Alexander with the philosopher's self-possession that he remarked as he went away, "If I were not Alexander, I should wish to be Diogenes."

In spite of his eccentricities, the philosophy of Diogenes represents the best teachings of the Cynics, for he emphasized the value of self-control and the necessity of returning to simplicity and nature. His peculiar manner of living was a result of his belief that pain and hunger are helps in the pursuit of happiness, and all pleasure is preventive of goodness. See Cynic School of Philosophy. B.M.W.

DIONYSIUS, *di o nish' i us,* **THE ELDER** (431?-367 B. C.), tyrant of ancient Syracuse, a man of obscure parentage who began life as a clerk in a public office. By his own ability and energy he rose until he made his power over Syracuse absolute. In his wars against Carthage he met with many successes, but was not able to drive the Carthaginians out of the island. He made many expeditions against neighboring cities and to the mainland of Greece and Italy. The towns he captured were destroyed, and the inhabitants were usually sold as slaves. Historians depict him as cruel, ambitious, vindictive and suspicious, a tyrant in a very real sense of the word. Under his rule, however, Syracuse became a brilliant center of Greek civilization, art and culture.

It was his son, Dionysius the Younger, in character much like his father, who is said to have condemned Pythias to death. This act is supposed to have given Damon his opportunity to prove that a man's faith in his friend may be a truly wonderful thing. See Damon and Pythias.

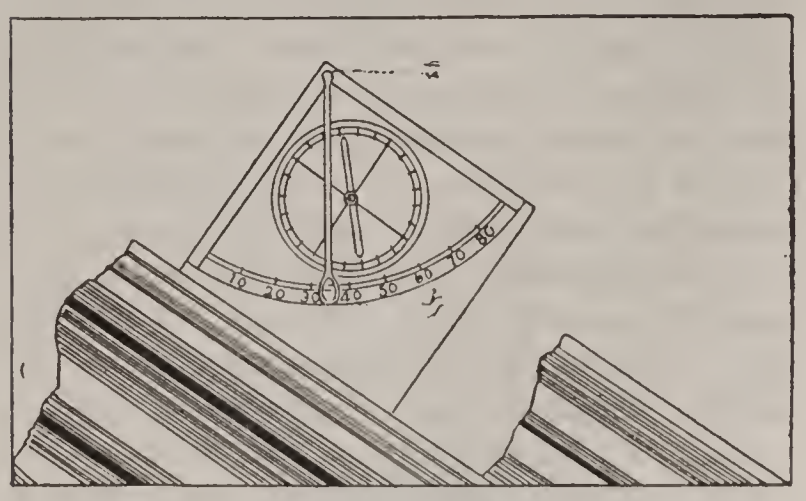
DIP. We often see rocks tilted up so that they almost stand on edge. We see others lying flat, and between these two positions there are rocks lying at all angles. The angle which the surface of a layer of rock forms with



ILLUSTRATING DIP AND STRIKE

a vertical line is called in geology the *dip* of the rock. Dip is measured by a very simple instrument called a clinometer, consisting of a square block of wood with a plumb line fastened to one corner and having the arc of a circle graduated in degrees marked around the opposite sides. When the block is placed upon the rock the plumb line takes a vertical position and the point it touches on the arc

tells the number of degrees of dip. The horizontal direction at right angles to the dip is called the *strike*.



HOW DIP IS MEASURED

DIPHTHERIA, *dif the'ri a,* an acute infectious disease of frequent occurrence among children, characterized by a very painful sore throat. The bacillus which produces diphtheria causes the formation of a false membrane composed of lymph, which appears first in patches on the mucous membrane of the tonsils; it then extends to the larynx, up into the nasal passages and into the mouth. In severe cases it may extend down into the esophagus, forming there such a growth as practically to close the windpipe and to cause suffocation. The glands in the neck and in front of the ear also become swollen and tender. If the diphtheria membrane is rubbed off a very tender bleeding spot will remain. Weakness and depression, fever, thirst, nervousness, sleeplessness and loss of appetite are typical symptoms. Meningitis and Bright's disease are frequently complications of diphtheria, and paralysis often occurs during the attack or a few weeks later. The disease begins with sore throat and low temperature, and such a condition should always receive immediate attention. Children showing white patches on throat or tonsils should be examined at once by a competent physician.

Treatment. Success with diphtheria depends upon early treatment, and that now in general use consists in the injection of an antitoxin (which see) into the body of the patient. This is a preparation containing a substance that counteracts the poisons developed by the germs and renders them harmless. Its use has reduced the number of deaths from diphtheria more than one-half, but it must be employed in the early stages of the disease. Delay in diagnosis and treatment of diphtheria cannot be too strongly condemned. Recovery depends upon checking the infection at the beginning.

Caution. Diphtheria is one of the worst of contagious diseases, especially among children. The patient should be isolated and all discharges, clothing, bed-linen and utensils used about the sick room should be thoroughly disinfected. After the patient's recovery, the house should be fumigated and every possible precaution should be taken to prevent the spreading of the disease. Diphtheria may occur in connection with other contagious diseases such as measles and scarlet fever, and patients suffering from these maladies should be carefully watched for its symptoms. Inoculating other members of the family with the antitoxin is practically certain to prevent the spread of the disease within the household, and this precaution should be used when children at school have been exposed, since it may prevent an epidemic. W.A.E.

DIPHTHONG, *dif'thong* or *dip'thong,* the sound produced by combining two vowels into a single syllable, as *ou* in *out,* and *oi* in *void;* these are examples of *proper* diphthongs. An *improper* diphthong is the combination of two or more vowels in the same syllable, only one of which is pronounced, as *ai* in *rain,* and *ea* in *breach.*

DIPLOMACY, *di plo'ma si,* the system, science, or courteous practice by which political negotiations between two countries are conducted. It involves intercourse on each side through accredited representatives, according to customs prescribed by international law; these agents, in order of rank, are ambassador, envoy extraordinary and minister plenipotentiary, minister resident, *chargé d'affaires,* secretary of legation and attaché. The greatest nations send to each other envoys of the highest rank; smaller countries appoint those lower in dignity, and receive representatives of like rank. The consular system of a country is not a part of its diplomatic service; its scope is purely commercial. See CONSUL.

A diplomatic office is not relatively an ancient institution. It was not a part of the Greek political system, neither did the Romans resort to it except to commission occasional embassies for special purposes. As relations between countries grew more complex there developed gradually a need of political representation at all times in the various capitals. Cardinal Richelieu is regarded as the originator of the system of resident ministers, although he was probably not the first to realize its advantages. Cobden, on the contrary, contended that personal representation had been

developed only to satisfy the vanity of governments and that all diplomatic relations might easily be conducted by letters and by telegraph.

A diplomatic officer abroad concerns himself only with affairs affecting the political welfare of his own government, or the rights of the citizens of his country living or traveling abroad. He is the accredited spokesman for his government, keeps informed on everything in affairs of state it is desirable for his home officials to know, and transmits this information in formal reports, using a cipher code. The practice of diplomacy has varied little in its forms for scores of years. It is marked by great dignity, polite ceremonials and every outward showing of studied cordiality. "Study the art of diplomacy," says Lord; "even in declaring war, men are quite courteous."

Diplomatic representatives enjoy important privileges and immunities, partly owing to the fact that they are the direct representatives of sovereign powers, partly because the important functions which they perform demand complete independence of action. The more important of these immunities are as follows:

(1) Exemption of the person of the minister from local jurisdiction, civil and criminal. In other words, he is not liable to arrest for any reason whatever, an exemption shared to a certain extent by his family and suite.

(2) Inviolability of his residence, papers and effects from any search or seizure.

(3) Exemption of his personal belongings from taxation.

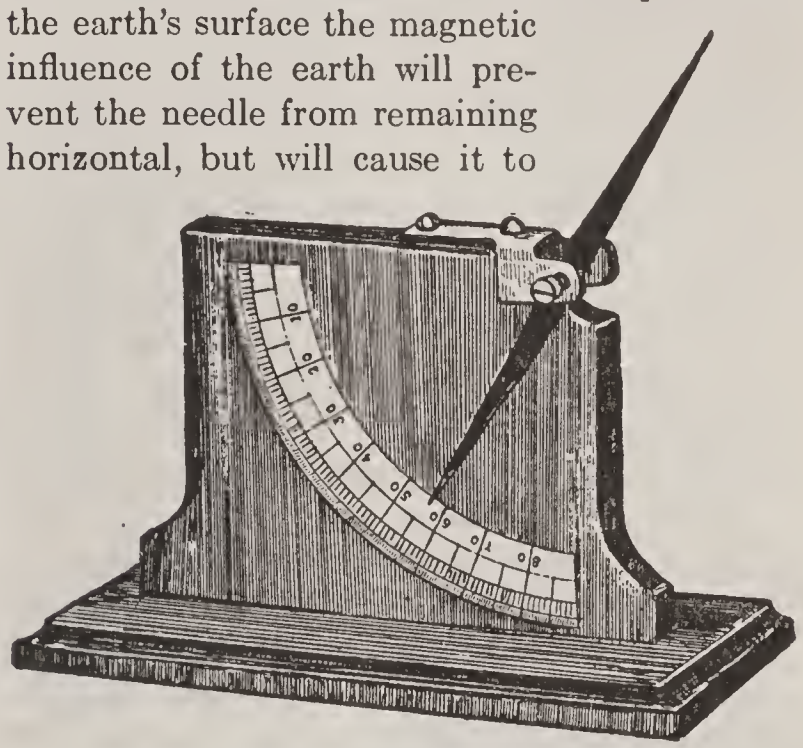
(4) Entire freedom of worship for himself and his suite. These privileges result from the principle known to law as *exterritoriality;* that is to say, by a legal fiction the minister is supposed to carry with him the jurisdiction of his home government over his person and residence, excluding to this extent the foreign jurisdiction.

The diplomatic affairs of each nation are under the direction of its *Foreign Office,* a term meaning the same as *Department of State* in the United States (see STATE, DEPARTMENT OF). W.B.G.

Consult Foster's *Practice of Diplomacy as Illustrated in the Foreign Relations of the United States;* Curtis's *United States and Foreign Powers;* Moore's *American Diplomacy.*

DIP'PER, or **WATER OUZEL,** *oo' z'l,* a little thrushlike bird which dips and dives under water. Several species are found in Asia, Northern Europe and in the mountains of Western America from Alaska to Mexico. The bird's waterproof plumage is dark colored, but the breast is white. It is short-winged, and its short, up-tilted tail makes it resemble a wren. The dipper lives along mountain streams, and dives into the water for its meals of snails and water insects, which it catches with its straight, compressed, sharp-pointed bill. The bird seems to delight in waterfalls, for it dashes into them in a fearless manner and goes entirely through a cascade to build its nest of moss in a sheltered crevice of rock.

DIPPING NEEDLE, a magnetic needle supported horizontally above a dial, so it can move toward and from a vertical position. It is used for measuring the magnetism of the earth at different places. At most places on the earth's surface the magnetic influence of the earth will prevent the needle from remaining horizontal, but will cause it to



DIPPING NEEDLE

dip in proportion to the power of magnetism exercised. At the magnetic equator alone will the needle retain a horizontal position. It would probably assume a vertical position at the north and south magnetic poles.

DIPTERA, *dip' ter a,* a word derived from the Greek, meaning *two-winged,* is the name of one of the largest orders of insects. It includes flies, the troublesome gnats, midges and mosquitoes. See INSECT.

DIREC'TORY, in French, **DIRECTOIRE,** the executive body appointed in 1795 to control the political destiny of France. It was composed of five members, called Directors, one of whom retired each year to make way for a new member. Already unpopular by reason of its management of internal affairs, it met with further disfavor because of the disastrous results of its military policy, and was overthrown by Napoleon in 1799. It was succeeded by the Consulate, with Napoleon as First Consul. See NAPOLEON I.

DISCI'PLES OF CHRIST, a religious body which originated in Western Pennsylvania in the early years of the nineteenth century, with the idea of securing Christian union by the

restoration of apostolic Christianity, in faith and practice.

The leaders of the movement were Thomas and Alexander Campbell, father and son. Thomas Campbell, a minister, emigrated from Ireland to America in 1807 and settled in Washington, Pa. Grieved at the divided state of the Church, he sought to bring the various branches of the Presbyterian Church in that vicinity into practical fellowship. Incurring the displeasure and censure of his own Church in this effort, he withdrew from its fellowship and organized the Christian Association, composed of those who shared his views. He set forth his beliefs in a *Declaration and Address,* in 1809, in which he urged a return to the New Testament as the only rule of faith and practice, and the only workable basis of Christian union. These views were endorsed by his son, Alexander, who at once became the champion of the plea. The leadership of the movement soon passed from father to son, whose gifts as a speaker and debater secured for him a considerable following.

The first organization was at Brush Run, in Washington County, Pa. As their investigations led them to become immersionists, they allied themselves with the Baptists. But as Mr. Campbell's views were not acceptable to many of that faith, he and his followers were compelled to form independent organizations wherever his teachings were accepted. This separation took place in 1830, and later absorbed similar movements in Pennsylvania and Kentucky. Alexander Campbell became the acknowledged leader, with Barton W. Stone and Walter Scott working in close association with him.

Doctrine. In doctrine the Disciples of Christ, in common with other evangelical bodies, hold to the great fundamental truths of the Fatherhood of God, the inspiration of the Scriptures, the divinity of Christ and the personality of the Holy Spirit. Like the primitive Church, they have no authoritative creed statement. They regard the Bible, particularly the New Testament, as sufficient for guidance in all spiritual matters, and Simon Peter's statement, "Thou art the Christ, the son of the living God," as the true confession of faith. They practice baptism by immersion and the weekly observance of the Lord's Supper, because this was the practice of the apostolic Church. The Church is congregational in government, the different churches coöperating in mission and benevolent work.

The Disciples control a number of schools of high standing, among them Drake University, Des Moines, Iowa; Hiram College, Hiram, Ohio; Transylvania College, Lexington, Ky.; Butler College, Indianapolis, Ind., and Bethany College, Bethany, W. Va., the latter founded by Alexander Campbell. In 1921 they claimed nearly 1,226,000 members, distributed among about 6,800 churches. They have a following in Great Britain, Canada, Australia and in several mission fields, but are most numerous in the United States, especially in the Central and Western states. See CAMPBELL, ALEXANDER. T.W.G.

Consult Gates's *Disciples of Christ;* Campbell's *Christian System.*

DIS'COUNT, a term applied in business to a deduction from a stated price or from a payment due at some future date. *Bank* discount and *trade* discount are the forms commonly used in modern business operations. *True* discount, once in general use, has been almost entirely superseded by bank discount.

Bank Discount is the deduction which a bank makes from the face value of a note for cashing it before it is due. Bank discount is computed in the same manner as simple interest; it is really simple interest, taken in advance. The difference between the face of a note and the discount is called the *proceeds,* and the interval between the day it is presented for payment and the day of its maturity is called the *time of discount,* or *time to run.* The following examples will make clear the principles governing the computation of discount:

Application. Case I. Mr. Brown, on April 1, 1916, presented a three-months' note at a bank to be discounted, or turned into cash. It was dated February 26, 1916, and its face value was $5,000. What sum was paid him, if the bank charged at the rate of 6% per annum?

Three months from February 26 is May 26, date of maturity.

From April 1 to May 26 is 56 days, the time to run.

Discount for 56 days = interest on $5,000 at 6% = $46.67.

$5,000 − $46.67 = $4,953.33, proceeds.

Therefore Mr. Brown received from the bank $4,953.33; that is, the bank charged him $46.67 for cashing his note. The full sum of $5,000 is collected by the bank on the date of maturity.

Case II. The second case involves the discount of an interest-bearing note. Suppose A gives B a note for $450, dated May 5, 1916, payable in 3 months, with interest at 6%. B takes the note to the bank on July 1, and

the bank discounts it at 8%. Find the proceeds and bank discount.

The day of maturity is three months after May 5, or August 5, 1916.

The amount of the note (principal + interest) on August 5, 1916, = the amount of $450 for 3 months at 6%.

Interest on $450 for 3 months (¼ year) at 6% = $6.75.

$450 + $6.75 = $456.75, amount.

Time to run = number of days between July 1 and August 5 = 31 days + 5 days or 36 days, or term of discount.

Discount = interest on $456.75 for 36 days at 8%.

Interest on $1 for 36 days at 6% = $.006; at 8% it is $.008. Interest on $456.75 = 456.75 × $.008 = $3.65.

Proceeds = $456.75 − $3.65 = $453.10.

Therefore B receives $453.10 on July 1, and the bank collects $456.75 on August 5, the date of maturity. In this case the bank computes the discount on the face of the note plus the interest.

Trade Discount, used generally by manufacturers and wholesale merchants, is the deduction of a percentage from the list price of merchandise. Merchants frequently offer a discount if goods purchased on credit are paid for before the debt becomes due, or a deduction may be made for cash payment. Moreover, after price lists are issued the market value of commodities may fall, necessitating changes in prices from day to day.

The price given in the price list is called the *list price,* and the list price, less the discount, is known as the *net price.* When two or more discounts are allowed, the first discount is deducted, the second is computed on the remainder and deducted from it, and so on.

Applications. (1) If a school board purchases books at 25% off for cash, what is paid for books listed at $100?

100% − 25% = 75%. 75% of $100 = $75, net price; or 25% of $100 = $25, discount. $100 − $25 = $75.

(2) At what price must a merchant mark goods costing $100 so that he may allow a discount of 20% from the marked price and still gain 10%?

Since he gains 10%, his selling price is 110% of the cost. The selling price is also 20% less than the marked price, or 80% of it. 110% of $100 = $110, selling price.

$110 = 80% of the marked price.

1% = 1/80 of $110 = $13.75. 100%, the marked price, = 100 × $13.75 = $137.50, the price at which the goods must be marked.

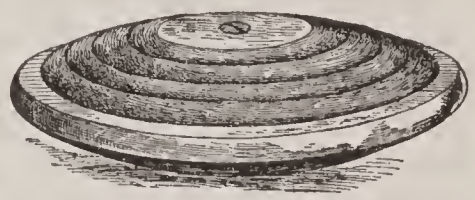
(3) Goods listed at $180 are sold at discounts of 10% and 5%. What is the net price to be paid?

100% = list price. 100% − 10% = 90%.
90% = new list price. 5% of 10% = 4.5%.
90% − 4.5% = 85.5%, selling price.
85.5% of $180 = $153.90, net price. B.M.W.

DIS'CUS, THROWING THE, an athletic exercise regarded by the ancient Greeks as one of the important tests of an athlete. The discus was a round plate of metal or stone, twelve inches in diameter, weighing four pounds seven ounces. The athlete stood in a marked space nine feet square and cast the discus somewhat as a modern quoit is thrown. One of the most remarkable statues in the world is that of the *Discobolus,* or *Discus Thrower,* made in bronze by the Athenian sculptor Myron, in the fifth century B. C. The athlete is seen with every muscle tense, just as he is about to hurl the discus. This statue has been extensively copied, one of the finest examples in marble now being in the Vatican at Rome.

THE DISCOBOLUS

After the statue of Myron. The discus thrower is shown at the moment of highest tension and, at the same time, the moment of rest.



THE MODERN DISCUS

Modern Discus-Throwing. When the Olympic Games were revived at Athens in 1896, contests in discus-throwing were introduced, and from that time the sport has been popular, both in Europe and in America. The modern discus, to conform to official regulations, must be of hardwood and must weigh four and one-half pounds. It is eight inches in diameter and two inches thick at the center, and is bound around with a ring of steel. Discus-throwing appeals to a far larger number of young athletes than does shot putting or throwing the fifty-six-pound weight, for the muscular strain required is much less. Proficiency is a question of "knack" rather than of great strength.

The discus thrower stands in a seven-foot circle, outside of which he is not allowed to step. The discus lies flat against the palm of his hand, and is merely held lightly in place and not grasped with the fingers. After a few preliminary swings and a rapid turn of the body the thrower releases his hold and the

discus sweeps through the air. A distance of 140 feet is a fair average for a trained athlete to make in throwing the discus. There is little or no danger of a beginner tiring himself or subjecting himself to undue strain by constant practice, and an expert can hurl the discus all day without becoming tired. It is therefore an exercise that has much to commend it.

DISEASE, *di zeez'*, a state of ill health not caused by old age. It exists among all forms of life, both animal and vegetable. The natural and normal state of any living thing is good health, when all the organs are in good condition and perform their functions in a normal way. An abnormal state, or ill health, exists either when the actual tissues of an organ are affected or when the organ is unable to work properly. Diseases, therefore, are roughly classed as *organic* and *functional*. In organic diseases, such as appendicitis or tuberculosis, the tissues of the organ become diseased and in course of time may degenerate; in functional disease, such as measles and nearly all other fevers, the organs are disturbed as the result of changes elsewhere. Frequently organic and functional disorders exist side by side.

Disease in the Human Body

Modern medicine divides the causes of disease into two groups; first, those which exist in the body, and second, those which are external. Primitive people always believed that disease was caused by external agencies. Their beliefs seem strange and often fantastic to us. The American Indians, for example, thought that disease was simply a manifestation of an evil spirit; they usually tried to frighten away the spirit by noise or by charms and incantations. Their medicine-man was supposed to be particularly endowed by the gods and to have great influence with the spirits. In our own day there are schools of science which regard disease as evil, and as curable either wholly or in part by will power or external mental influence.

During the Middle Ages, and indeed until comparatively-recent times, many diseases were believed due to an excess of blood, and the most common remedy was to let some of the blood run out of the body. Ordinarily the sicker the person was, the more blood he had to lose—a principle which saved few lives. In the course of time all disease was recognized as due to natural causes, but the nature of these and their treatment is still a matter of controversy. For further details, see MEDICINE AND DRUGS.

Germ Theory of Disease. As early as the seventeenth century the theory was suggested that disease was sometimes caused by the entrance of foreign organisms into the body. It was not until about 1876, however, that the experiments of Koch, Pasteur, Tyndall and others established the fact beyond dispute.

According to the accepted theory, many diseases are caused by *germs,* which are minute organisms of a vegetable nature. This curious fact is usually misunderstood; germs are a form of vegetable life, not of animal life. The tiny organisms, which enter the body in a number of ways, cause chemical changes. These changes in turn produce poisons which cause the obvious signs of disease, such as fever, delirium, depression, nausea and convulsions. The poisons also prevent the organs from working properly and thus cause disease. To prove positively that a disease is caused by germs it is necessary to prove three facts:

(1) A certain germ must always be found in connection with the disease in question.

(2) It should not, as a general thing, be found in other diseases.

(3) It must be possible to make a pure culture —that is, to grow this germ entirely apart from any other germs. This culture must be able to inoculate animals with the disease.

The most important diseases that have been proved to be germ diseases ar anthrax, diphtheria, influenza, leprosy, meningitis, pneu-

monia, infantile paralysis, tetanus, typhoid fever and tuberculosis. There are a few others which have some of the characteristics of germ diseases, but their nature is still in doubt. Among these are measles, smallpox and whooping cough. See BACTERIA AND BACTERIOLOGY.

Modern investigation seems to point to the fact that every infectious or contagious disease is due to some germ, and that each disease is produced by only one kind of germ. A disease cannot arise until the germ has entered the body. Every germ disease, therefore, must be preceded by another case of the same disease. In this fact lies the hope and the suggestion of a method for lessening, if not of completely exterminating, such diseases. If the particular microbe of each disease is discovered, the conditions which make its further existence possible can be studied. The information gained would make it possible in almost every case to prevent the development of the germs in the body. Even in those diseases which still baffle science, the presence of germs has led to steps for preventing the spread of the disease. Isolation hospitals are the principal means for preventing epidemics, but the use of antiseptics is also noteworthy (see ANTISEPTIC). In fact, the discovery that wounds and cuts could be saved from infection by cleanliness and antiseptics was one of the greatest advances made by modern medicine.

Germs in the Human Body. The human body is continually at war with all kinds of germs, and it is only when its defenses are broken down that the germs can attack the interior of the body. The strongest defense that the body has is the skin. Under normal conditions it is practically impossible for a germ to pass through the skin into the body. If, however, there is a cut, or a scratch, or any kind of an abrasion on the skin, there is an easy opening for invasion.

There are other openings of the body that offer easy access. Most germs enter the system through the mouth, the nose or the eyes. These are all lined with mucous membrane, which is very easily infected. Once the germs do get into the body they usually increase rapidly in numbers, and unless their growth is checked they destroy the tissues or produce poisons, technically called *toxins*. The blood can rebuild the tissues, if the person is strong enough, and the white corpuscles in the blood help to destroy the poisons. The blood itself and the pores of the skin also carry off some of the toxic, or poisonous, products. J.H.K.

Diseases of Animals

Animals are subject to many of the diseases which afflict man, pneumonia and tuberculosis being prominent among them. Animal diseases may be classed under five heads, as follows:

1. **Infectious Diseases.** Among these are anthrax, cattle plague, dog distemper, hoof and mouth disease, fowl cholera, hog cholera, rabies and tuberculosis. These are generally regarded as the most dangerous of animal diseases, because whole herds may be affected. In many cases the animals die, and in others they must be slaughtered to prevent the spread of epidemics. The origin and cure of many of these infectious diseases are still unknown, and it is noteworthy that cleanliness and perfect sanitation do not prevent them. Special care should be taken to prevent infectious disease among milch cows, because their milk is almost sure to be diseased and to cause sickness among human beings who drink it.

2. **Poison Diseases.** Many animals are poisoned by mineral substances, such as arsenic, copper, lead, phosphorus, mercury and zinc. The result of such poisoning is usually death. Then, too, though it may seem strange, there are many plants or plant products which poison animals. Among these are opium, strychnine, hemlock, larkspur and the famous loco-weed. A "locoed" horse, for example, may die or simply run wild and become useless. Snake-bites and bee-stings are also poisonous, to a greater or less degree, to all animals.

3. **Constitutional Diseases.** Under this head are classed such diseases as diabetes, scurvy and a few other diseases, all of which also affect human beings. They are far less common than the infectious or poison diseases.

4. **Organic Diseases.** This class comprises all diseases, such as pneumonia, which affect the organs. Heart disease and various disorders of the digestive system are common. Some organic diseases are also infectious.

5. **Diseases Due to Parasites.** Almost every species of animal, especially when domesticated by man, is subject to the attacks of parasites. Domestic animals usually have worms in larger or smaller numbers, but it is only when they become numerous that their presence affects the general health. Tapeworms cause nodular

disease of fowls, and trichina causes trichinosis of hogs. The latter, like many other diseases, may attack man. Sheep are particularly susceptible to worms, and many flocks are destroyed by the lung and stomach worms and by the fluke-worm, which affects the liver. Mange in all animals is caused by a tiny parasite, the mite (see MITES). There are a few flies, notably the horse-fly, the bot-fly and the screw-worm fly, which spend a part of their short lives as parasites. Sometimes the activities of these fly-parasites have fatal results, but usually they merely cause irritation and a temporary depression due to loss of blood. Ticks and fleas are also extremely irritating, but not usually dangerous.

Diseases of Plants

It has been only in recent years that the importance of plant diseases as related to agriculture and to general economic conditions has been recognized. Millions of dollars are lost each year through rust and other diseases. Wheat, potatoes and grapes are among the crops which seem to suffer most. The easiest way to learn the chief facts about plant diseases is to divide them, according to their causes, into four groups. Diseases are due to (1) fungi; (2) bacteria; (3) insects; (4) functional disturbances.

1. **Fungi.** The diseases due to fungi (which see) are the commonest and most destructive. Practically every living thing in the vegetable kingdom is susceptible to fungi, either through the roots, leaves, stem or fruit, and sometimes through all of them. The seeds or spores are tiny, and are carried everywhere by the winds, which thus spread the disease. The method of attack varies. Some fungi, usually called wound-fungi, can enter the plant only through a bruise or cut in the skin. Some irritate the plant's skin and cause fermentation, which dissolves an opening, and still others worm their way through the pores. Once the fungi get a footing, the disease spreads rapidly, either stunting the plant or causing knots, warts or other peculiar swellings. Some of the best-known fungi are potato rot, smut or rust, grape rot, mildew and scab.

2. **Bacterial Diseases.** These are usually and quickly fatal. The only way to prevent an epidemic is to destroy any infected plant as soon as the disease becomes evident. The bacteria enter the plants at any part, and spread rapidly through the entire structure. The blight of pears, cabbage rot, brown rot of potatoes and tomatoes and various diseases of corn, celery and apples are of bacterial origin. Until recently the bacterial nature of these diseases has been disputed, but is now generally acknowledged.

3. **Diseases Caused by Insects.** Plants in greenhouses or under other artificial culture are more likely to suffer from insects than are plants growing under natural conditions. Many plants, however, are attacked by insect diseases, even when growing under normal conditions. Phylloxera, which attacks the roots of grape vines, is the worst of these pests. Each year it lays waste many rich acres in France, Germany and other European countries. Aphides and eel worms are pests affecting oranges, cucumbers, roses, carnations and other plants. See PHYLLOXERA; APHIDES.

4. **Functional Disturbances.** These are technically known as diseases due to physiological causes. In other words, they are due to interference with the normal functions of the plant. Too much or too little water, light or heat are the commonest of these causes. They usually affect the whole plant and make it wither. The remedies for the diseases are obvious; the only problem is to find out in time what is wrong with the plant. J.H.K.

Consult Newman's *Bacteria and the Public Health;* Muir and Ritchie's *Manual of Bacteriology.* For plant diseases, consult Massee's *Diseases of Cultivated Plants and Trees;* for animal diseases, Mayo's *Diseases of Animals.*

Related Subjects. The following articles in these volumes deal either with specific diseases or with some topic closely related to the general one of disease, all relating to the human body:

Abscess
Adenoids
Anaemia
Angina Pectoris
Aphasia
Apoplexy
Appendicitis
Asphyxiation
Asthma
Astigmatism
Atrophy
Bacteria and Bacteriology
Baldness
Blindness
Boil
Bright's Disease
Bronchitis
Bunion
Burns and Scalds
Cancer
Canker
Catalepsy
Cataract
Chicken-Pox
Chilblain
Cholera, Asiatic
Cirrhosis
Colds
Colic
Corns
Cough
Croup
Dandruff
Delirium Tremens
Diabetes
Diphtheria
Dropsy
Dyspepsia
Eczema

Elephantiasis
Epidemic
Epilepsy
Erysipelas
Fainting
Fever
Frostbite
Gangrene
Gastritis
Goiter
Gout
Hay Fever
Headache
Hernia
Hiccough
Hives
Hookworm
Hydrophobia
Hysteria
Immunity
Infantile Paralysis
Infant Mortality
Influenza
Insanity
Insomnia
Itch
Jaundice
Kleptomania
Laryngitis
Lead Poisoning
Leprosy
Lockjaw
Locomotor Ataxia
Lumbago
Lunacy
Lupus
Malaria
Measles
Meningitis
Monomania
Mumps
Myopia
Nausea
Nephritis
Neuralgia
Neurasthenia
Neuritis
Neurosis
Neurotic
Nightmare
Palpitation of the Heart
Paralysis
Parasitic Diseases
Pellagra
Peritonitis
Plague
Pleurisy
Pneumonia
Putrefaction
Quinsy
Rheumatism
Rickets
Ringworm
Saint Vitus's Dance
Scarlet Fever
Scrofula
Scurvy
Seasickness
Sleeping Sickness
Smallpox
Spasm
Squinting
Sunstroke
Tic Douloureux
Tonsilitis
Trichina
Tuberculosis
Tumor
Typhoid Fever
Typhus Fever
Varicose Veins
Vertigo
Vomiting
Whooping Cough
Wounds
Yellow Fever

See, also, related lists under AGRICULTURE, subhead *Animal Diseases;* ANATOMY, and MEDICINE AND DRUGS.

DISINFECT'ANTS, certain substances which possess the power of destroying disease germs. The term is derived from two Latin words meaning *without infection.* In cases of sickness of an infectious nature such as diphtheria, scarlet fever, typhoid, measles, smallpox and others, the greatest importance is attached to the thorough disinfection of everything that has been used by or brought in contact with the patient. One of the most reliable, most easily obtained and cheapest disinfectants is *chloride of lime.* A mixture of six ounces of the chloride in a gallon of water will be found sufficiently powerful to destroy virulent germs in thirty minutes. *Carbolic acid* is widely used, but demands great care in handling. *Cresol,* a product of coal tar, is now regarded as a very reliable disinfectant. *Formaldehyde* is also effective, and may be used in powdered form or as a gas (see FUMIGATION). For cleansing and purifying sinks, drains and water pipes a solution of *permanganate of potash* proves valuable. Surgeons' instruments are sterilized, or disinfected, by exposure to formaldehyde gas or by boiling in water to which a little *bicarbonate of soda* has been added. Another practical and useful disinfectant is *iodine.* See ANTISEPTIC; DISEASE.

DISRAELI, *diz ra' li,* BENJAMIN, Earl of Beaconsfield (1804-1881), a great English statesman and author, the only Jew who has been Prime Minister of Great Britain. He was the eldest son of Isaac Disraeli (1776-1848), a well-known man of letters, who, with his entire family, renounced Judaism in 1817 and was baptized into the Church of England. After an indifferent schooling young Benjamin worked from his seventeenth year in a London solicitor's office, and was then in 1824 entered at Lincoln's Inn to study law. That profession, however, proved distasteful to him, and with the encouragement of several literary friends he completed a novel, *Vivian Grey,* which was a success. It won for him an entry into the most exclusive literary and social circles, and made him, at the age of twenty-two, the hero of the hour.

DISRAELI

During the next decade Disraeli continued to write at intervals, and he also entered political life. In 1837 he was elected to Parliament as a Tory, having been unsuccessful in several previous attempts, and within three weeks after his entrance he attempted a speech on an Irish election petition. With his foppish clothing, his fantastic speech and extravagant gestures, he presented a ludicrous figure, and the House laughed him down; but before taking his seat he exclaimed, "I shall sit down now, but the time is coming when you will hear me." Meanwhile, he had not turned from literature, through which he continued to voice his political principles. In the novels *Coningsby* and *Sybil,* noteworthy for the brilliant character pictures, thinly disguised, of public men of his day, he urged adoption of the reform program

advocated by the Young England party, of which he was a member and in later days the leader.

In his early years in politics he was a rigid protectionist, and in 1846, when Peel advocated the repeal of the Corn Laws, Disraeli attacked him in many bitter speeches. Later he abandoned his protectionist principles, stating by way of apology that he thought the needs and feelings of the nation had changed. His first official position was that of Chancellor of the Exchequer, which he held in 1852 and three times subsequently, and in 1868 he succeeded the Earl of Derby as Prime Minister. Shortly after he took office his party was defeated at the elections, but he was again in power from 1874 to 1880.

As Prime Minister. One of Disraeli's earliest acts as Prime Minister was to introduce certain of the reforms, such as poor laws and factory legislation, which he had advocated in his novels. The most noteworthy feature of the administration, however, was its imperialistic foreign policy. The purchase of the Suez Canal shares, the proclamation of Queen Victoria as Empress of India, and the thwarting of Russia in 1878 in its designs on Turkey were the most memorable acts of his Ministry. In 1876 he was created Earl of Beaconsfield.

His Character. Disraeli's personality has always remained more or less of a mystery. In his own day there were few, if any, who pretended to understand his character, and students of his life have been baffled at every turn by apparently inexplainable acts or characteristics. This is perhaps best explained by the fact that, devoted as he was to England, he was in no sense an Englishman, but was Oriental in his ideals and tastes and in the theatrical touch which was evident in everything he did. No public man of his generation, however, left a stronger impression on the popular mind of England or has been remembered with more lasting affection. The anniversary of his death, April 19, is still celebrated in England as "Primrose Day"; the primrose, for some unaccountable reason, is popularly supposed to have been his favorite flower. W.F.Z.

DISTEM'PER, an infectious and contagious disease which attacks various animals, and causes the death, especially, of many young dogs. Animals over three years old are rarely affected. It is caused by a germ which produces catarrhal inflammation, and is found in the lungs, nose, eyes and nervous systems of animals. The symptoms of the disease vary according to the organ in which it settles. The first signs of distemper, however, are loss of appetite, fatigue, trembling, chills and a dry, hot nose. Other and later symptoms are watery and inflamed eyes, sneezing, itching of the nose, coughing, restlessness, red spots on the skin and loss of weight.

Treatment. To check and cure the disease, the animal should be placed in a clean, warm place free from draughts, and be carefully nourished with milk and strong meat broth in which the yolk of an egg has been beaten. According to the organ especially affected, various other measures must also be taken. If the eyes are inflamed they should be washed with a five per cent solution of boric acid or a one per cent solution of carbolic acid. If the digestive tract is affected one-grain doses of calomel three times a day bring relief. For coughing, two grains of compound licorice powder two or three times a day will be found effective.

Horses, mules, cats, wolves, hyenas and monkeys are also subject to forms of this disease. If domestic animals are attended to at the first sign of infection, warmth and careful nourishment will effect a cure.

DISTILLATION, *dis ti la' shun.* That water left exposed to the air will disappear by drying up is a familiar fact. The warmer the water the more rapidly will it "dry up," but when this happens the water is not annihilated. It has simply changed into a gas, that gas which we call *water vapor,* or *steam.* The word *evaporation,* applied to the drying up of water, is a very appropriate one. When water is boiling it forms the same gas. The clear space just above the spout of a boiling kettle is filled with this water vapor. The cloud which we see above the clear space consists of droplets of water, which have been formed by the cooling of the gas. We say that the gas has *condensed* into liquid water. In the ordinary boiling of a kettle of water, however, not all of the water vapor by any means condenses into liquid droplets; even many of the droplets which are formed evaporate again if the air of the room is warm and dry. If we invert a cold milk bottle or fruit jar above the spout of the kettle, a larger proportion of the gas will condense, and we may be able to collect enough of the condensed water to drop or run in a little stream from the mouth of the bottle. A still larger quantity will be obtained if we arrange to keep the bottle cool by wrapping a wet towel around it.

The process of boiling a liquid, such as water,

and condensing the vapor which it forms is called *distillation.* In the above example, the water collected in the milk bottle is *distilled water.* Distillation, it will be noted, embraces the two processes of *evaporation* and *condensation.* Water is sometimes distilled to purify it. If the original water contains salt (or any other substance) that does not evaporate at the boiling temperature, that substance will remain in the kettle. The distilled water will not be salty. The natural purification of water by distillation is constantly proceeding on a grand scale. Water is evaporated from the sea, from the soil and from the leaves of trees and plants. The water vapor so formed is recondensed into clouds and mists and dew. Rain and dew are forms of naturally-distilled water.

The apparatus for distilling is called a *still.* It has three essential parts: (1) the *boiler,* or receptacle to hold the liquid after distillation; (2) the *condenser,* in which the vapor is cooled to reconvert it into liquid; (3) the *retort,* in

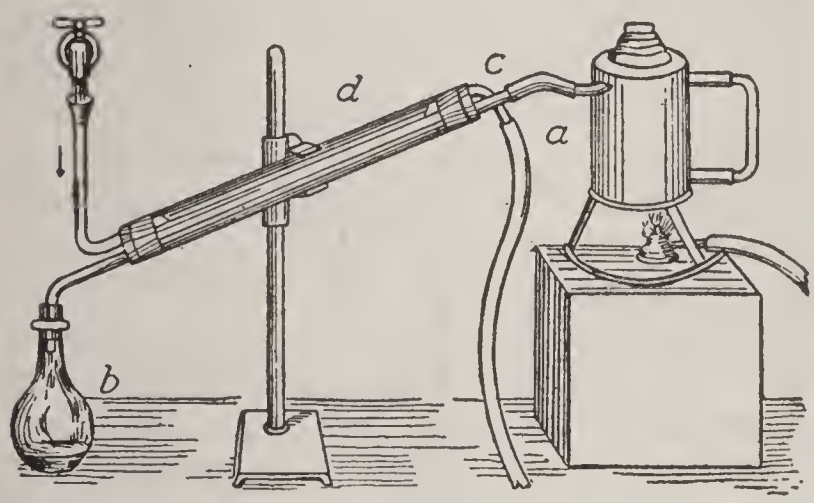


FIG. 1

In this kind of still *a* is the boiler, *b* is the retort for collecting the distilled liquid, *c* is the pipe leading from *a* to *b,* and *d* is the condenser, through which the tube *c* passes, surrounded by running cold water.

which the distilled liquid (the distillate) is collected. In our experiment the kettle was the boiler, the cooled bottle the condenser, and a glass held under the mouth of the bottle would constitute a retort. The accompanying diagram (Fig. 1) shows the parts of a simple still. In large stills the condenser usually consists of a long pipe coiled in a spiral and immersed in a tank through which cold water is constantly running (Fig. 2).

Fractional Distillation. As a rule it is not possible to separate two liquids by a simple distillation. Although alcohol, for instance, boils at 172° F. (forty degrees below the boiling point of water), water will evaporate fairly rapidly at that temperature. If, then, we boil a mixture of alcohol and water and condense the vapor, the product obtained will contain water as well as alcohol. But the distillate collected *at the first* will have a much larger proportion of alcohol than the liquid in the retort. So by collecting the distillate in *fractions, we* can partially separate the two liquids. By redistilling each of the fractions we can carry the separation further. Fractional distillation is made use of in distilleries, and the proportion of alcohol in *distilled liquors,* such as brandy, whisky and rum, is always much greater than in liquors (such as wines and beers) made without distillation.

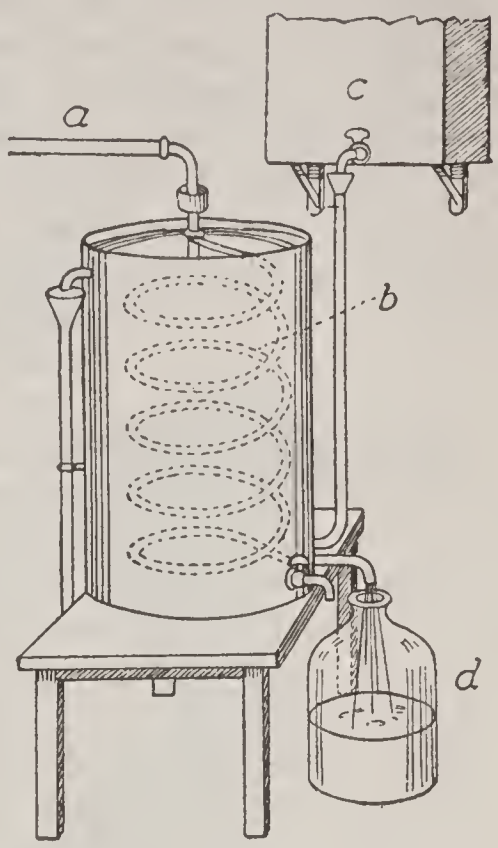


FIG. 2

In this larger condenser *a* is the pipe leading from a boiler; *b* is a coil of pipe called the *worm,* and it is surrounded by cold water which flows into the vessel from the tank *c; d* is the retort for receiving the distilled liquid.

Petroleum refining is another industry in which fractional distillation plays a very important part. Petroleum (which see) is a mixture of a great many substances. By fractional distillation it is separated into a number of fractions, which are used for different purposes. The first fractions obtained in distilling petroleum are naphtha and benzine. Next comes gasoline, afterwards kerosene, and then heavier oils which are used as fuels or for lubricating machinery. All of these fractions are still mixtures of different substances, but the original, very complex mixture has been sufficiently separated to yield a number of useful products. In a similar manner a number of useful products are obtained from *coal tar.*

Destructive Distillation. In simple distillation and in fractional distillation, no new substances are formed. Those present are merely separated, completely or partially. The term *destructive distillation* is applied to processes in which new substances are produced. When wood is heated in closed boilers, charcoal, acetic acid, wood alcohol and acetone are produced, together with water and some gases. When coal is similarly treated, coal gas, ammonia, coal tar and coke are obtained. These

substances were not present in the original coal or wood. They have been produced by the decomposition of the substances originally present. Destructive distillation is therefore a chemical process, while simple and fractional distillation are purely physical. J.F.S.

Related Subjects. This topic may be followed further by reference to the topics in these volumes which are named below:

Acetic Acid	Coke
Alcohol	Gas
Carbon	Gasoline
Charcoal	Petroleum
Coal	Wood Alcohol
Coal Tar	

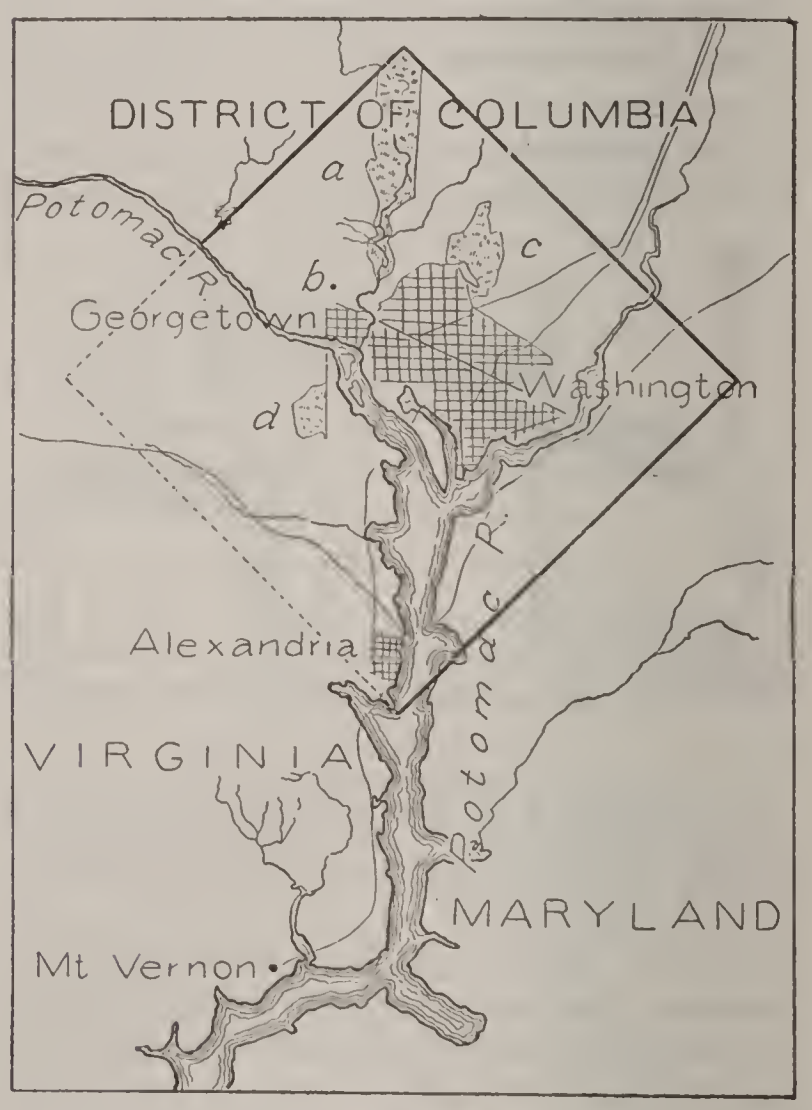
DISTILLED LIQUORS, those alcoholic liquors which are manufactured by fermentation and distillation. Most of the common distilled liquors, such as rum and whisky, are made directly from corn, wheat and other grains, or from potatoes. The grain is ground and soaked in warm water, forming *mash.* Yeast is then added, and the mash is allowed to ferment, forming *wort,* from which the spirit is distilled. The first product contains impurities from which the spirits are separated by re-distillation. The purification is generally known as the process of *rectifying.* Brandy is made by distilling wine. The production of distilled liquors is an extensive business, but one which is steadily decreasing in volume. Including commercial alcohol, it amounted in the United States to about 194,000,000 gallons a year, before prohibition became effective by Constitutional amendment, and the government revenue derived from it was about $160,000,000 a year. Peoria, Ill., was the largest manufacturer of distilled liquors in the world; the revenue paid by the distilleries of that city to the United States previous to 1915 was more than enough to build the Panama Canal.

Canada manufactured about 6,500,000 gallons of distilled liquors per year, from which the Dominion derived a revenue of nearly $9,500,000 before the day of prohibition. See WHISKY, BRANDY, RUM, and other liquors; also INTERNAL REVENUE; DISTILLATION.

DISTRICT OF COLUMBIA, the official name of the seat of government of the United States. It occupies a tract of land ceded by the state of Maryland, containing about seventy square miles on the north side of the Potomac River, about 100 miles from its mouth and forty miles southwest of Baltimore. The District originally included also about thirty square miles ceded by the state of Virginia, in which is the present city of Alexandria. Georgetown and Anacostia were included in the Maryland grant. The latter is said to have been the site of the famous Indian village of Powhatan, visited by Captain John Smith in 1608. The scenery of the District back from the river is very picturesque. The climate is mild, but is subject to violent changes of temperature.

The population in 1800 was 14,000; in 1910 it was 331,000, of which about 100,000 were colored. In 1920 the population was 437,571; much of the increase represented wartime government employes.

Government. The present form of government in the District of Columbia was inaugurated in 1878. The governing body consists of three commissioners, who devote their entire time to the public service. They are selected



DISTRICT MAP

(*a*) National Park.
(*b*) Naval Observatory.
(*c*) Soldiers' Home Park.
(*d*) Arlington National Cemetery.

by the President, with the approval of the Senate. Two are chosen from civil life and hold office three years; the third is an officer of the corps of engineers of the United States army, with a term of office not exceeding four years. Congress passes all laws for the control of the District. Half the expenses of the government are paid by Congress, the remainder by local taxation.

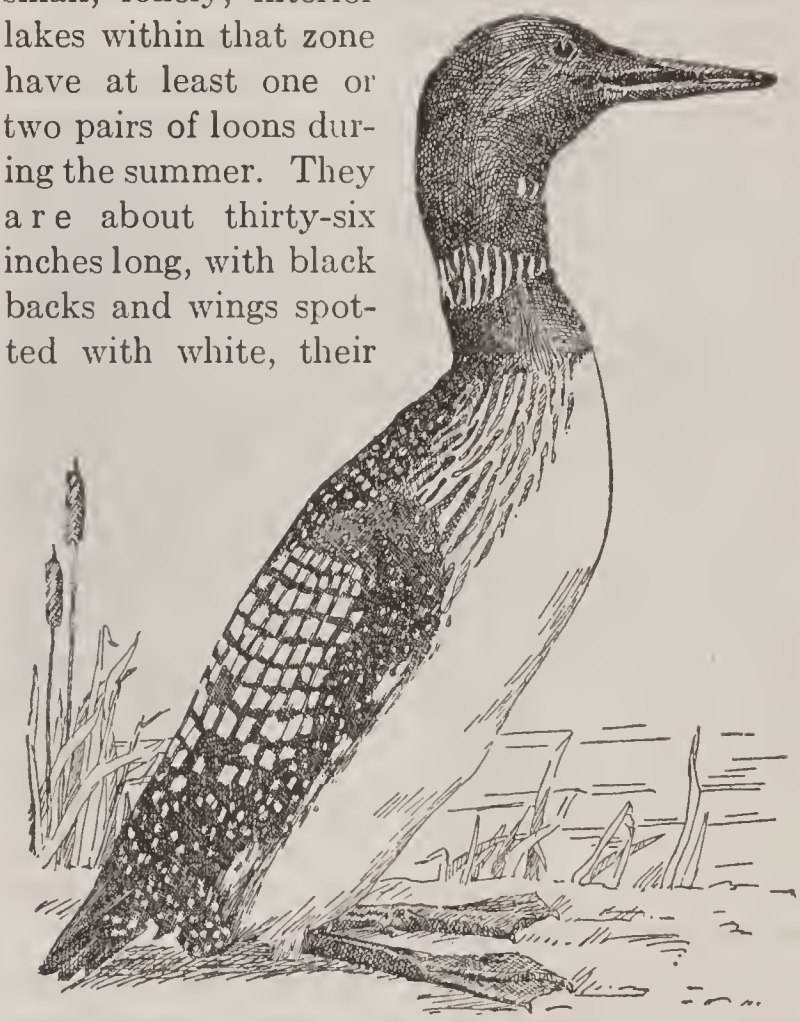
The District was organized solely as the seat

of the national government, and the people residing in it have no vote. Government employees retain their former places of residence for voting purposes, and many of them travel long distances to vote at important elections. So that they may not lose all influence in their local affairs, the citizens have formed a number of associations which discuss municipal needs. These they present to Congress with petitions, which usually exert considerable influence on that body. In February, 1917, after years of effort, Congress passed a law making the District prohibition territory, the measure to take effect November 1 of the same year.

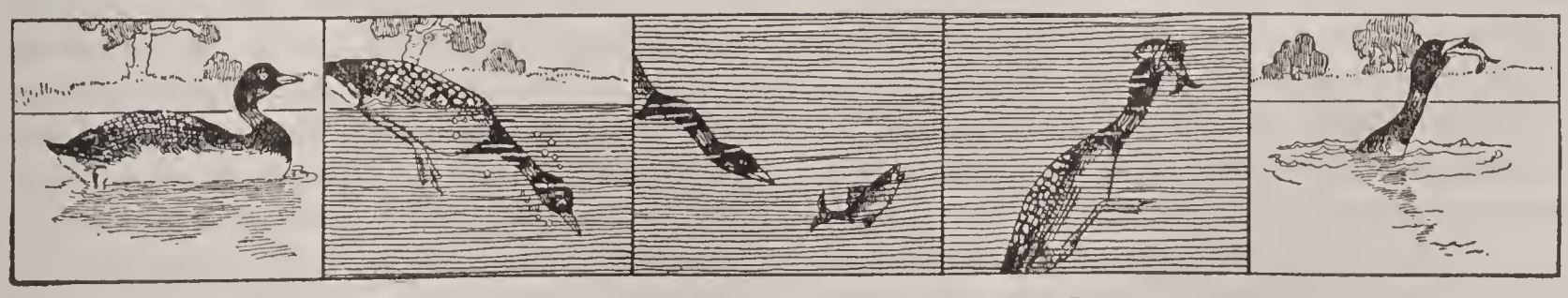
History. Shortly after the Revolutionary War the Congress of the young republic found it necessary to secure a place in which to establish a permanent home for the government. There were several important offers made, but it was not until July 16, 1790, that Congress voted to accept the tract on the Potomac. Of this land Maryland ceded 69.25 square miles and Virginia 30.75 square miles. George Washington, then President, was authorized to select the site for the Capitol, anywhere between the mouths of the Conogocheague and the eastern branch of the Potomac. Commissioners were appointed in 1791, and Major L'Enfant, a French engineer, was employed to draw up plans for the capital city. This he did on such a far-seeing scale that Washington is to-day one of the most beautiful cities in the world. The commissioners christened the Federal District the "Territory of Columbia" and the capital the "City of Washington." The district was divided into two counties—Washington (Md.) and Alexandria (Va.). Later the name was changed to District of Columbia.

In December, 1800, Congress held its first session in the new Capitol. The first President to be inaugurated in Washington was Thomas Jefferson, in 1801. Mr. Jefferson was very democratic, and it is recorded of him that on the day of his inauguration he rode unattended to Washington, tied his horse to the fence of logs and entered the Senate chamber alone to take the oath of office. In the course of time the great buildings necessary for conducting the government were erected; but as they were all on the Maryland side of the Potomac, the people of Virginia became dissatisfied and asked that the tract of land they had donated be returned to them, which was done in 1846. In 1895 the city of Georgetown became a part of the greater city of Washington. K.A.G.

DIVER, or **LOON,** is a name given to a number of water birds which are skilful divers, especially those related to grebes. Loons, or *great northern divers,* breed from the Northern United States to the Arctic Circle, and most small, lonely, interior lakes within that zone have at least one or two pairs of loons during the summer. They are about thirty-six inches long, with black backs and wings spotted with white, their heads and necks being glossy black and green, the latter with a collar of white streaks. The tails are short, but well formed; the feet are black and webbed. They are really the largest and handsomest of diving birds, but their uncanny screams, sometimes resembling rough, jeering laughter, are far from musical, and suggested the name *loon,* although they are by no means stupid. The slang phrase *loony* was not derived from the name of this bird, as many suppose, but from the word *lunatic.*



THE DIVER, OR LOON



HOW THE LOON GETS HIS DINNER

These birds feed chiefly on fish, for which they dive. Their flesh is dark and tough, but they are sometimes killed for food. The *black-throated loon* is smaller than the *great northern diver* and has a throat entirely black. It is very common in Canada. The *red-throated diver,* only about twenty-five inches long and of duller coloring than the loon, is also a common species of diver, and in Scotland is called the *rain goose.*

DIVIDE′, in physical geography, is the name given a crest of land, or water-parting, which separates the streams flowing into one main river from those flowing into another; or, in other words, a height of land which separates

ILLUSTRATING TWO DIVIDES

the headwaters of one river system from another. It is also called a *watershed.* .

A divide may consist of low land, like the Height of Land, which extends across the great plain in North America and separates the rivers flowing into Hudson Bay from those flowing into the Mississippi basin, or it may consist of high land with steep slopes, like the Rocky Mountains, which separate the rivers flowing into the Mississippi from those flowing into the Pacific. On Cutbank Pass in the Glacier National Park one may pour water from a pail into three different rivulets which will carry it into Hudson Bay, the Pacific Ocean and Gulf of Mexico, respectively. This point is actually the top of the American continent. There are several places in America where the beginnings of streams flowing to the Pacific and to the Gulf are within a few feet of each other.

DIVINATION, *di vi na′shun,* is the practice of determining the issue of events by signs and omens, and by lot or systems of fortune-telling. It rests upon the assumption that human fate is closely related to the forces of nature in a protective or providential relation, and implies also the view that the reading of nature is to be accomplished by a mystical guessing of its secret meaning. These ideas underlie magic and survive in superstition (see MAGIC; SUPERSTITION). Divination constitutes so large a part of the procedures of magic, of the occult, and of the pseudo-sciences, that information should be sought under these heads. It will be sufficient to survey the types of divination and give a general setting for its varied practices, constituting as they do one of the most comprehensive and suggestive reactions of the primitive mind (and of earlier forms of thinking) to the events of the material and spiritual world.

The division is fairly clear between natural and artificial forms of divination, the latter patterned upon the former and in course of time giving rise to elaborate systems. The natural varieties of divination proceed upon omens and portents in the course of nature, the conception being that the intervening gods or spirit-forces indicate the issue. The direct search for such inspired messages led to the institution of oracles, in which, as in the Delphic oracles, the god spoke directly through the inspired medium (see ORACLES). More artificial was the institution of augury, which, as the word indicates, detected the omen in the flight of birds. Dreams seem to have been generally regarded as prophetic, and their interpretation became one of the arts of the priest-magician or seer. Oracles and dreams leave much to the imaginative skill of the interpreter; the oracular pronouncement was typically vague, capable of several interpretations, and thus was at once shrouded with an air of mystery and left room for the later adjustment of the issue to the prophecy.

The unsought portent or omen remains the type of the natural divination, in a primitive sense providential. The appearance of a comet, of a storm, of an eclipse, of a volcanic eruption, or again, the shapes of clouds and the movements of swarms of insects were directly read as omens or warnings; similarly, the appearance of a flock of birds would indicate the fate of an expedition. The sight of a hawk would presage victory; of a crow, defeat; birds appearing to the left would have one meaning; to the right, another; their flight in one direction would be lucky; in another, unlucky. The hoot of an owl would be a bad sign, the cry of an eagle, a good sign. Any accident would be similarly interpreted. A typical instance is

the familiar one of the Roman general who stumbled as he stepped upon the shore of a land he sought to conquer; this would be a bad omen, but he made it a good one by treating the misstep as intentional, with the words, "I salute thee, mother earth." Xenophon mentions the incident that during an assembly some one sneezed, which was taken as a favorable omen for the matter under advisement. The tendency to systematize omens led to more and more artificial devices, while their incorporation into the general systems of magic made of divination an elaborate art.

When advice is sought for a particular issue which is in doubt, the appeal to lot follows; yet the answer is not regarded as chance but as directed by hidden forces of a magical nature. Such procedure may involve the method of representation or symbol; thus a tree is planted at the birth of a child, and by its growth is divined the growth or early death of the child. Similarly, a set of arrows may be set up in the wind, each representing a young brave, and the one whose arrow falls last is chosen as leader. The casting of lots by bones out of which grew dice, by spinning of cocoanuts (a primitive roulette) and the use of cards as a means of deciding issues have a further interest in that they appeal to the gambling instinct, which is also ancient and widespread. That gamblers are proverbially superstitious about their luck may point to an underlying common habit of mind. But divination develops many varieties in which the "religious" implication persists; of such nature is the pricking for texts in the Bible, to indicate desirable or timely decisions. Names for baptism might be selected in this way; though superficially resembling the custom obtaining among primitive people, who thus try to determine which ancestor has returned in the newborn child, the custom has obviously a different social status.

Divination leads to fortune-telling in general. The use of cards is typical. By attaching one fate to each of the four suits and further varieties of fortune to each of the faces, endless combinations are possible and all sorts of issues in love, in business, in travel, in speculation, in life, in health and disease, in recovering lost articles, may be provided for. Similarly, all the varieties of objects and incidents that occur in dreams, by far-fetched analogy and an artificial distribution of fate, may become signs of what is about to happen (see SUPERSTITION). Whether referred to dreams or to daily life, the divining habit attaches significance to trivial incidents; spilling salt, stubbing one's toe, stepping on cracks, forgetting an article of attire, getting up with the left foot foremost, and also such playful customs as pulling petals of daisies to see whether "he loves me" or "loves me not," the lore of hang-nails and the various divinations (in teacups, in the flame of candles, in melted wax) that are used on Hallowe'en (the night when spirits return to earth) illustrate the vestiges of beliefs in divinations. The systematic forms of fortune-telling embody in crude and distorted manner the lore of astrology and the related pseudo-sciences, and have little interest outside of this relation.

A special interest attaches to the forms of divination which play to the subconscious indications of the performer. The best known of these is the *divining-rod* for locating underground water. A forked hazel rod (the details have only a superstitious meaning) is held loosely in the hand as the diviner walks over the ground; and where it dips water will be found. The dipping is due to the subconscious movements of the "dowser" (as he is called in England), to the shrewdness of his reading the surface indications of a proper place for a well, and to the fair chance of finding water rather generally in localities where the practice prevails; also to the neglect of observing failures and the exaggeration of successes, which is the human habit.

Special mention must be given to a form of divination which invites the imaginative fancy of the seer. The reading in a mirror or on the surface of the water issues of events or what is going on at a distance is a power accredited to certain persons in ancient and modern times; it has been given the name of *crystal-gazing* (also *scrying*). Its use in divination was directly to project the future, to see what is going on at a distance and for such concrete purposes as the detection of criminals. That such visions are in reality the projections of a vivid imagery (such as all can command in limited measure with closed eyes) is clear; that their definiteness is aided by the reflection; that the movements seem in a measure independent of the control of the gazer, but actually are contributed by subconscious as well as conscious memories and desires—these considerations give the process a psychological interest. The interpretation of such visions as are prophetic or telepathic rests upon a very different basis. They form pictorial

accompaniments to the current of thought which, as in dreams, may be influenced by undercurrents of desire and anticipation, and thus make plausible the use of the power (which is very unequally distributed) for purposes of divination. J.J.

Relating to Various Beliefs. The articles on the following topics, while not bearing on divination, are of interest in this connection.

Alchemy	Palmistry
Astrology	Phrenology
Clairvoyance	Physiognomy
Conjuring	Psychical Research
Demonology	Psycho-Analysis
Faith-Cure	Spiritualism
Hypnotism	Subconscious
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind Reading	Theosophy
Necromancy	Trance
Occult	Witchcraft

DIVINE RIGHT OF KINGS, the belief that sovereigns derive their authority to rule, not from the consent or desire of their subjects, but directly from God, whom they represent; in other words, those who subscribe to such a creed believe "the king can do no wrong." This doctrine reached its highest development in England during the time of the Stuarts, and in France during the reign of Louis XIV. It is still maintained by some in theory, but has ceased to have a practical political meaning, for even in strong monarchies the people are more and more holding their rulers to strict accountability. The term came into use in a general way in the seventeenth century. It has also a religious application, an example being the doctrine of the infallibility of the Pope. See STUART, HOUSE OF.

DIVING. Merely "to plunge into water headforemost" (this is the dictionary's first definition of the word *dive*) does not sound particularly pleasant. But anyone who has learned to dive—or one who has watched boys and girls, and grown-ups, too, dive from a board and clamber quickly out of the water for "just one more turn," no matter how many plunges they have taken—knows that there are few sports more fascinating. Good divers know, too, that nothing gives the individual such perfect control over all his muscles as the repeated effort to dive well.

In a diving contest the judges mark the performers for their proficiency in three things—gracefulness while in the air, ability to enter the water without splashing and ease in emerging from it. Inexperienced divers appear awkward in the air because they hold themselves stiffly in the position in which they leave the board, but a graceful diver seems to move in the air with as much freedom and

A GOOD DIVE

If this boy straightens his left leg, throws his toes even farther back and does not bend his hips until he is completely submerged, he will enter the water with scarcely a splash.

self-control as on land. Smoothness in entering the water comes from holding the body in a straight line from finger-tip to toe's-end. When the body is half under water the back

A POOR DIVE

This boy will splash gallons of water, because his arms and legs are spread apart and his body is bent at the hips.

can be bent and the head and arms pointed upward, but, unless carefully controlled, an upturn started before the feet are submerged will cause the legs to drag.

Deep-Sea Diving. To go down among the fishes and the queer creatures of the ocean

depths, to visit perhaps with the fabled mermaids, must have been thought of as a delightful adventure by boys and girls and their romantic elders for many ages. When men began to sail the seas and ships were often wrecked, there was added the romance of sunken treasure, which even to this day is the chief inspiration of deep-sea diving.

The Diving Bell. In ancient times there were professional divers for recovering wreckage who worked, as do the modern pearl divers of the Orient, without mechanical appliances. But of course they were unable to stay under water more than two or three minutes, and both Greek and Roman historians tell of curious inventions made to enable them to keep at work longer. One of these, the diving bell, is supposed to have been revived by Roger Bacon in 1250. If you turn a dish upside down and push it straight downward into the water, the air inside will be carried down with it, as you may see by the bubbles that come up if you tip the dish slightly; the diving bell was just a huge inverted dish with tubes through which fresh air could be supplied. Men could work inside it for several hours.

How a Modern Diver Works. Before going below the surface, a diver of to-day dons a waterproof suit. At the neck of the suit is a metal ring into which a helmet is screwed. The helmet is provided with windows, to enable the diver to see, and with two rubber tubes; through one of the latter a supply of air is pumped from above, and the other serves to carry off the foul air. The helmet is made of copper. Formerly a diver had to communicate with those above the surface by jerking a rope, but modern diving outfits include telephones. A loud-sounding receiver is placed in the crown of the helmet and a transmitter is fixed between the windows, or eyes, directly opposite the diver's mouth. This apparatus has been so perfected that it is now possible for the attendant above to speak to several divers at the same time and for the divers themselves to be put in direct communication with each other.

To enable a diver to sink to the bottom and to preserve his balance while there, his boots have leaden soles and he wears two sheets of metal weighing about forty pounds each, one over his chest, the other on his back. Each boot weighs sixteen pounds. He also carries necessary tools in a strong leather belt, and is provided with electric lights, either powerful arcs of 3,000 candle power connected with dynamos above, or electric torches supplied with their own batteries.

Until recently it has not been possible for divers to work at a great depth, but in 1907 the British government perfected apparatus which was used 200 feet below the surface, and in 1915, when a torpedo boat sank at Honolulu, divers of the United States navy reached a depth of 288 feet. C.H.H.

DIVISIBIL'ITY OF NUMBERS. When one number can be divided by another, giving no remainder, we say the first number is "divisible" by the second. We sometimes say "exactly divisible," but this is not necessary since "divisible" is used to signify "exactly divisible." The divisor in such cases is called a "divisor" of the number, meaning an "exact divisor"; for example, in $160 \div 8 = 20$, 160 is "divisible" by 8, and 8 is a "divisor" of 160.

Tests for Divisibility. *Divisibility by 2.* A number is divisible by 2 if it ends in 0, 2, 4, 6 or 8; as 20, 18.

Divisibility by 3. A number is divisible by 3 if the sum of its digits is divisible by three; for example, 17841. The sum of its digits is $1+7+8+4+1$, or 21, which is divisible by 3. Here we use the word *digit* to mean the *number for which the digit stands.*

Divisibility by 4. A number is divisible by 4 if it ends in two zeros, or if the number represented by the last two digits is divisible by 4; for example, 700, 132, 86388.

Divisibility by 5. A number is divisible by 5 if it ends in 0 or 5; for example, 80, 65, 700.

Divisibility by 6. An even number the sum of whose digits is divisible by three is divisible by 6; for example, 174, 42726. 174 is an even number; the sum of its digits ($1+7+4=12$) is divisible by 3, and 174 is divisible by 6. $174 \div 6 = 29$. See that the same is true of 42726.

Divisibility by 8. A number is divisible by 8 if it ends in three zeros, or if the number represented by its last three digits is divisible by 8; for example, 16000, 19648, 2048.

Divisibility by 9. A number is divisible by 9 if the sum of its digits is divisible by 9; for example, 27648 ($2+7+6+4+8=27$); 604071 ($6+4+7+1=18$). 27 is divisible by 9, and 27648 is divisible by 9. 18 is divisible by 9, and 604071 is divisible by 9.

Divisibility by 11. Find the sum of the alternate digits beginning with the first digit of the number; find the sum of the alternate digits beginning with the second digit of the number. Find the difference between these sums. If this difference is zero or a number

divisible by 11, the number is divisible by 11; for example, 819192. (8+9+9)—(1+1+2)=22. 22 is divisible by 11; 819192 is divisible by 11. 819192÷11=74472. Another illustration: 455488. The difference between the sums of the alternate digits is (4+5+8=17)—(5+4+8=17)=0, and the number is divisible by 11. 455488÷11 =41408.

Divisibility by 7. The test is so much more difficult than the division itself is, except for very long numbers, that the test is used rarely. It is given below:

Take the last six digits at the right as a number; take the next six digits as a number and so on. Find the sum of these numbers. If the sum is divisible by 7, the number is divisible by 7; for example, 344519,485268.

```
   485268
   344519
7 | 829787
   118541
```

Since this sum is divisible by 7, we know that the number is. It is seen that for numbers of less than 7 digits, the test has no advantage, and has little, if any, for numbers of more digits.

Casting out of 9's. This is a test used as a check on work in the four fundamental processes. It is open to criticism as a check because it will not show up an error of 9 or any multiple of 9.

Test for Addition. Cast out the 9's from each column, and note the remainders or the excess (as it is called); then cast out 9's from the sum of these excesses. Then cast out 9's from the sum of all the addends. If the excesses obtained in both cases agree, the sum is correct. For example:

```
 694      4+2+6+8=2×9+2
 832
 796      9+3+9+5=2×9+8
 458
2780      6+8+7+4=2×9+7
```

Excesses are 2, 8, 7. 2+8+7=9+8. 8 is the excess after casting 9's from the columns. 2+7+8+0=9+8. 8 is the excess after casting 9's from the sum. The excesses agree. We may cast out 9's from the addends horizontally instead of vertically, as follows:

```
6+9+4=2×9+1
8+3+2=1×9+4
7+9+6=2×9+4
4+5+8=1×9+8
```

Sum of excesses=1+4+4+8=9+8. The excess is 8, and agrees with the excess of the sum as seen above.

Test for Subtraction. Cast out the 9's in the subtrahend, and the 9's in the difference. Add the excesses found thus and cast the 9's from the sum. Then cast 9's from the minuend, and find the excess. If this latter excess agrees with the former the answer is correct. This follows from the method in proving addition, since the minuend is the sum of the subtrahend and difference.

Test for Multiplication. Cast out 9's in the multiplicand and find the excess; cast out 9's in the multiplier and find the excess; find the product of these excesses and cast out 9's from it, and note the excess. Now cast out 9's from the product and note the excess. If these last excesses agree, the product is correct; for example:

```
  98743      (9+8+7+4+3)=3×9+4
   6582
 197486      (6+5+8+2)=2×9+3
 789944
 493715      4×3=12=9+3
 592458
649926426
```

Excess is 3. (6+4+9+9+2+6+4+2+6)=5 ×9+3. Excess is 3. Excesses agree; product is correct. We may also test the addition of the partial products as one would test any addition.

Test for Division. Cast out 9's in divisor and note the excess; cast out 9's in the quotient and note the excess. Find product of these excesses; cast out 9's and note excess. Then cast out 9's from the dividend and note the excess. If these last two excesses agree the quotient is correct. In case of a division which gives a remainder, cast out 9's from the remainder and note the excess obtained. Add this to the excess obtained after casting 9's from the product of the divisor and quotient, and this sum must agree with the excess in the dividend. Problem: Make use of test in proving correctness of quotient in example, 74947352 ÷974=76948.

Illustration of first case:

```
      76948
974 | 74947352     9+7+4=2×9+2
    6818
     6767         7+6+9+4+8=3×9+7
     5844
      9233        2×7=9+5
      8766
       4675
       3896
        7792
        7792
```

Excess is 5. 7+4+9+4+7+3+5+2=4×9+5 Excess is 5. Quotient is correct.

Illustration of second case:

```
        1677
274 ) 459636
      274          (2+7+4)=9+4
      1856
      1644         (1+6+7+7)=2×9+3
       2123
       1918        4×3=9+3
        2056
        1918
         138
```

Excess is 3. (1+3+8)=9+3; excess of remainder is 3. 3+3=6. Excess is 6. 4+5+9+6+3+6=3×9+6. Excess is 6. Excesses agree; the quotient is correct.

The 9's are cast out in a shorter way than the work above indicates; for example, in the number 459636, the dividend in the last problem, one sees 9 and cancels it; then sees 4 and 5, then 6 and 3, and cancels them thus ~~4~~~~5~~~~9~~~~6~~~~3~~6, leaving the excess 6. A.H.

DIVISION, *di vizh'un.* Division comes easily out of multiplication, as shown below:

$9\times8=72$	$n\times9=54$
$4\times9=36$	$n\times3=27$
$7\times4=28$	$n\times6=48$

In the group at the left, we use 8 nine times and have 72; we use 9 four times and have 36; we use 4 seven times and have 28. In the group at the right, someone uses a certain number of 9's and has 54; uses a certain number of 3's and has 27; uses a certain number of 6's and has 48.

Let it be the teacher who does this. She says, "How many 9's did I use?" or "By what did I multiply 9?" and the child, seeing it from the multiplication view, answers "6." The problem appears:

$$n\times9=54$$
$$6\times9=54$$

The same method brings answers to the others and they appear:

$n\times3=27$	$n\times6=48$
$9\times3=27$	$8\times6=48$

The question "How many 9's did I use to make 54?" easily becomes, "How many 9's are in 54?" and we have division in form as well as in thought. The problems now are:

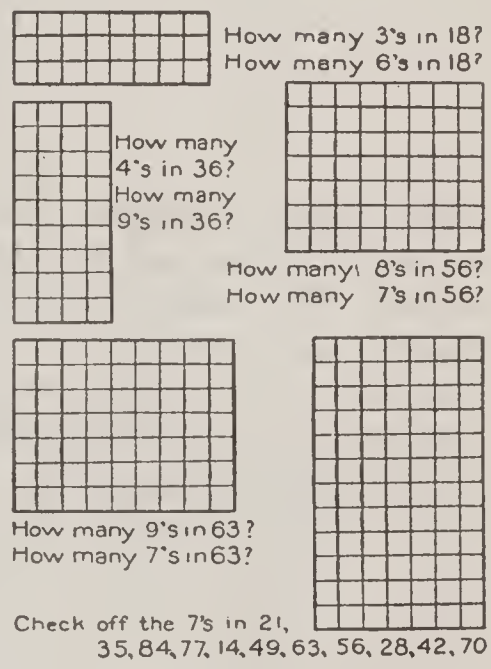
$$54\div9=n$$
$$27\div3=n$$
$$48\div6=n$$

They should be read "How many 9's in 54?" "How many 3's in 27?" and so on, just as the multiplication form, $n\times9=54$, is read. The very technical expression, "54 divided by 9= what?" should not be used too early, and even when used later should alternate with the clearer, more suggestive question, "How many 9's in 54?" This should be used far along into the middle grades.

Much work of this kind will carry multiplication right into division. We may write the two views side by side:

Multiplication	Division
$n\times8=32$	$32\div8=n$
$n\times9=27$	$27\div9=n$
$n\times7=63$	$63\div7=n$
$n\times5=35$	$35\div5=n$
$n\times8=56$	$56\div8=n$
$7\times8=56$	$56\div8=7$
$4\times n=24$	$24\div4=n$
$4\times6=24$	$24\div4=6$

With this the transition is made from multiplication to division. It should be accompanied by concrete illustrations; use should be made of blocks, squared paper, etc.



The use of areas on squared paper helps greatly at this place, as shown in the illustration which appears herewith.

Teachers should give opportunity for concrete division to such an extent that the child realizes that he is measuring a quantity of length or space or weight, etc., by finding how many of a definite measure or unit there are in the quantity measured. When the child goes from the concrete problem to figures, he must see that the dividend represents the quantity he is measuring, the divisor represents the measuring unit, and the quotient tells how many of these units there are in the quantity he is measuring. (Quotient means *how many.*)

Home Helps. The parent has excellent opportunity to help the child at home in division. Here there are many quantities to be measured and the child may move about freely and choose his material and discuss the measuring process, and have father or mother help him carry out his work. Some suggestions for home work:

(a) Room 19 feet by 18 feet. Measure with a yard stick. The problem becomes 19÷3=6⅓; 18÷3=6.

(b) Mother buys 2 dozen eggs. She uses 6 for each day's breakfast. Child finds, by count-

ing the eggs in 6's, how many breakfasts 2 dozen will provide. $24 \div 6 = 4$.

(c) A peck of potatoes may be measured off in 6's or 4's or 8's or whatever mother says is the daily average used. The problem may be $50 \div 4$, 6 or 8; the dividend is the number of potatoes in the peck, the divisor the number used per day, and the quotient the number of days a peck will last.

(d) The same may be done with apples.

(e) Child's allowance for a week may be divided into groups of pennies for daily spending.

(f) Divide large groups of pennies into groups of 5, or 6, or 8, etc.

Short Division. We shall see how short division is derived from multiplication:

221	$884 \div 4 = n$
4	
800	4|884
80	200
4	20
884	1
	221

How many 4's in 800? Look at the problem in multiplication and see that we put 200 4's in 800. How many 4's in 80? Look at the multiplication and see that we put 20 4's in 80. How many 4's in 4? One.

So we have in the quotient 221. The teacher here emphasizes that this means there are 221 4's in 884. Another illustration:

321	$963 \div 3 = n$
3	
900	3|963
60	300
3	20
963	1
	321

Another:

$848 \div 4 = n$

(1)	(2)
4|848	4|848
200	212
10	
2	
212	

Read the answer here 200, 10 and 2 to see its agreements with the answer to the left.

As the child writes the answer, he should read it in full; for example in $2\overline{|846}$, the answer 423 is read 4 hundred, as the 4 is written, twenty as the 2 is written, and 3. Then follow easily such problems as these:

3|1200	6|1800	8|2400
400	300	300
4|804	3|1209	7|707
200	400	100
1	3	1
201	403	101

Have the pupils speak and write in full the answers to each division above; as, "How many 3's in 1200?" Answer "400." "How many 8's in 2400?" Answer "300." "How many 4's in 800?" Answer "200." "In 4?" Answer "1." The difficulty which such problems usually present to children is thus cleared away. It helps them to avoid such common expressions as "4's in zero," "3's in zero," etc., which are meaningless to the child.

7|2814	9|3627	6|5442
400	400	900
2	3	7
402	403	907

The above three are typical of another difficulty which is here avoided by this same writing and reading of answers in full. In the first problem the child thinks, "How many 7's in 2800?" He says "400," and seeing 14, says "402." In the second he thinks, "How many 9's in 3600?" and says "400," and seeing the 27, realizes there are 3 more, and says "403."

Division with Reduction. Such division comes from multiplication where there is "carrying" or reduction (see MULTIPLICATION). We shall look at such multiplication and division side by side:

$26 \times 2 = n$	$52 \div 2 = n$
2	
12	$2\overline{\|52} = 40 + 12$
40	$20 + 6 = 26$
52	
241	$723 \div 3 = n$
3	
600	$3\overline{\|723} = 600 + 120 + 3$
120	$200 + 40 + 1 = 241$
3	
723	

Many simple cases of this kind should be worked out in multiplication and in division, that the child may see that in division he is taking apart a number along the lines upon which it was built up, or along its constructive lines. Several illustrations follow:

$161 \times 6 = n$	$966 \div 6 = n$
6	
600	$6\overline{\|966} = 600 + 360 + 6$
360	$100 + 60 + 1 = 161$
6	
966	
$93 \times 8 = n$	$744 \div 8 = n$
8	
720	$8\overline{\|744} = 720 + 24$
24	$90 + 3$
744	

$1732 \div 4 = n$

$4\overline{|1732} = 1600 + 120 + 12$

$400 + 30 + 3 = 433$

The child may separate it thus:

$$4\overline{)1732} = 1600 + 100 + 32$$
$$400 + 25 + 8 = 433$$

By separating it in several ways, each of which brings the correct number of 4's in 1732, he will come to see that there is one way that follows the lines of construction, and that this particular method serves his purpose best. He learns in this to look for a multiple of the divisor in the first part of the dividend and to look intelligently, a point that is of vital importance in division, and does away with the "wild guessing" so familiar to teachers.

After much of this work, the child becomes independent in both short or long division, and sees clearly what he is doing. He sees that he is finding how many times a certain measure (the divisor) is contained in the unmeasured whole (the dividend), and he finds it by thinking of the dividend as a product. This method of separating the dividend into its parts is much more effective than the usual method of placing the remainder after each division as a small figure in front of the next digit, and reducing, as $\begin{array}{r} 4\overline{)7^{4}3^{1}2} \\ 1\ 8\ 3 \end{array}$, because the eye helps and the child sees that 732=400+320+12. The latter meaning is not clear in the other method. The concise method comes later, and the child divides without any devices, in the desired form, as $\begin{array}{r} 4\overline{)732} \\ 183 \end{array}$. He sees the 400, the 32 (or 320) and the 12, while in the quotient he sees 100, 80 and 3.

Long Division. We need this process when a problem in division becomes too complex to carry in the mind. The greater the power of registration of the mind, the less often we have recourse to long division. The mind should be led to solve problems by short division beyond the divisor 9 or 12; for example, 7525÷25, 6500÷13, 62500÷25, 950÷19, 72480÷24, 850÷170, 840÷21, 6946÷23.

A divisor consisting of tens and units is simpler when the units digit is small; for example, 91 is a simpler divisor than 38; 72 than 49 and so on. This should be considered carefully in approaching long division. While the units digit remains small, the quotient figure is determined largely from the tens digit, and the eye helps more in the process.

After the preceding work in short division the child is ready to look at the more difficult numbers along the lines of construction. He readily thinks of the parts of the dividend, and the parts in the divisor; that is, he realizes the units, tens, hundreds, etc., of each number, as follows:

$64 \times 21 = n$
21
1200 = 20×60
80 = 20× 4
60 = 1×60
4 = 1× 4
1344

$1344 \div 21 = n$

$$20+1\overline{)1344} = 1200+140+4$$
$$1200+60 = (60\times20)+(60\times1)$$
$$80+4$$
$$80+4 = (4\times20)+(4\times1)$$

Here he notes the corresponding parts in the division and the multiplication. Another illustration:

523×42
42
20000
800
120
1000
40
6
21966

$21966 \div 42 = n$
$500+20+3=523$

$$40+2\overline{)20000+1000+800+120+46}$$
$$20000+1000 = (500\times40)+(500\times2)$$
$$800+120+46$$
$$800+40 = (20\times40)+(20\times2)$$
$$120+6$$
$$120+6 = (3\times40)+(3\times2)$$

$57188 \div 58 = n$ (Note the units digit is large.)

986
×58
45000
4000
300
7200
640
48
57188

$900+80+6=986$

$$50+8\overline{)45000+7200+4000+940+48}$$
$$45000+7200$$
$$4000+940+48$$
$$4000+640$$
$$300+48$$
$$300+48$$

Here the child sees clearly that he must consider the units digit of the divisor, and sees it is an element to be reckoned with in finding each quotient figure.

Now we bring the process gradually to a more and more concise form, taking care, however, that the pupil understands the reason for the omission of each step.

(a) $57188 \div 58 = n$

$900 + 80 + 6$

$50+8 \overline{)57188}$

$45000 = 900 \times 60$

12188

$7200 = 900 \times 8$

4988

$4000 = 80 \times 50$

988

$640 = 80 \times 8$

348

$300 = 6 \times 50$

48

$48 = 6 \times 8$

$900 + 80 + 6 = 986$

(b) $58 \overline{)57188}$

$52200 = 900 \times 58$

4988

$4640 = 80 \times 58$

348

$348 = 6 \times 58$

986

(c) $58 \overline{)57188}$

$52200 = 900 \times 58$

4988

$4640 = 80 \times 58$

348

$348 = 6 \times 58$

986

(d) $58 \overline{)57188}$

522

498

464

348

348

This final form should be seen to mean just what the preceding one means, and the so-called "bringing down the next figure" should be understood to be subtraction of the product of the divisor and partial quotient from the dividend.

The next example illustrates the method followed when there is a larger divisor than those used above.

$403176 \div 428 = n$

942

$428 \overline{)403176}$

$385200 = 900 \times 428$

17976

$17120 = 40 \times 428$

856

$856 = 2 \times 428$

942

$428 \overline{)403176}$

3852

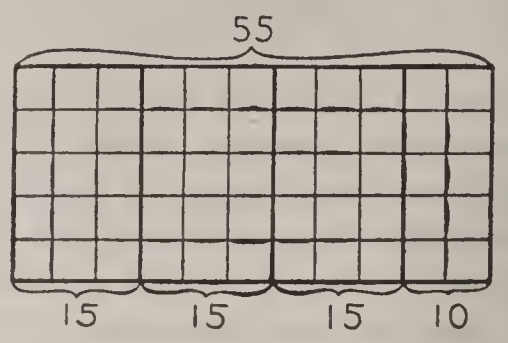
1797

1712

856

856

Meaning of Remainder. $15 \div 2 = n$. How many 2's in 15? There are 7 2's, or 14, and a remainder of 1, or there are 7½ 2's in 15. $21 \div 6 = n$. We can take 3 6's out of 21 and have 3 left; that is, we find 3½ 6's in 21.



The diagram shows concretely the dividend (55), divisor (15) and remainder (10).

$7430 \div 18 = n$

412

$18 \overline{)7430}$

72

23

18

50

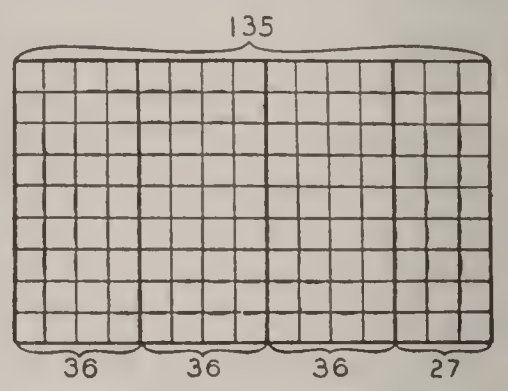
36

14

We can take 412 18's out of 7430 and have 14 left. Note that the sum of the subtrahends and the remainder makes the dividend, as shown below:

7200 = first subtrahend
180 = second subtrahend
36 = third subtrahend
14 = remainder
7430 = dividend

The quotient is 412, with a remainder of 14, or the quotient is 412$\frac{7}{9}$. This last says there are in 7430, 412 18's and $\frac{7}{9}$ of 18. If I had \$7430, I could buy at \$18 per acre 412 acres and have \$14 left, or I could buy 412$\frac{7}{9}$ acres.



Showing in concrete form the remainder 27, resulting from dividing 135 by 36.

Some Short Methods of Division. (1) Divide by 10, 100, 1000, etc., by striking off one zero, two zeros, three zeros, etc. For example, 128ø, 6øø, 178øøø; or move the decimal point one, two, three, etc., places to the left. For example, 15.6, 8.43, .967.

(2) To divide by 5, multiply by 2 and move the decimal point one place to the left. For example, $248 \div 5 = \frac{248 \times 2}{10} = 49.6$.

(3) To divide by 25, multiply by 4 and move the decimal point two places to the left. For example, $3628 \div 25 = \frac{3628 \times 4}{100} = 145.12$.

(4) To divide by 50, multiply by 2 and move the decimal point two places to the left. For example, $784 \div 50 = \frac{784 \times 2}{100} = 15.68$.

(5) To divide by 33⅓, multiply by 3 and move decimal point two places to the left, as: $800 \div 33\frac{1}{3} = \frac{800 \times 3}{100} = 24.00$.

(6) To divide by 125, multiply by 8 and move decimal point three places to the left, as: $1280 \div 125 = \frac{1280 \times 8}{1000} = 10.240$.

(7) To divide by 250, multiply by 4 and move decimal point three places to the left, as: $6845 \div 250 = \frac{6845 \times 4}{1000} = 27.380$.

(8) Divisor ending in zero. When the divisor ends in zeros the work may be shortened as shown below:

$7864 \div 60$	$96348 \div 800$
$6\|0\|786\|4$	$8\|00\|963\|48$
$131\frac{4}{60}$	$120\frac{348}{800}$

Proofs for Division. (1) For proof by "casting out 9's," see DIVISIBILITY OF NUMBERS, subhead *Casting out 9's.*

(2) Product of divisor and quotient plus remainder (if there is one) will equal dividend if problem is correct.

Partition and Division. See FRACTIONS.

Suggestions for Sources of Problems. From the following, home problems can easily be suggested, based on actual conditions:

(1) Yearly rent to find rent per month.

(2) Monthly or weekly salary to find average salary per day.

(3) Monthly expenses for food, for clothes, for amusement, etc., to find average expenditure per day.

(4) Amount of corn, wheat, etc., raised on a certain number of acres, to find average yield per acre.

(5) Expenses for fertilization, seed work, etc., on a certain number of acres, to find the average expense per acre.

(6) Cost of city lot of 35 feet, 50 feet, etc., to find price per front foot.

(7) Cost of a farm of 160 acres, 252 acres, etc., to find cost per acre.

Sources for Problems in Newspapers, Magazines, etc. (1) Exports of grain, lumber, etc., for a number of years, to find yearly average.

(2) Number of bushels in yield from given number of acres to find average, and from that to find gain or loss in average yield per acre, through the given years.

(3) Population and area of countries or states given to find the density of population; that is, to find the number of persons to each square mile.

(4) Wealth of a city or nation, and the population given to find the average wealth of the individual.

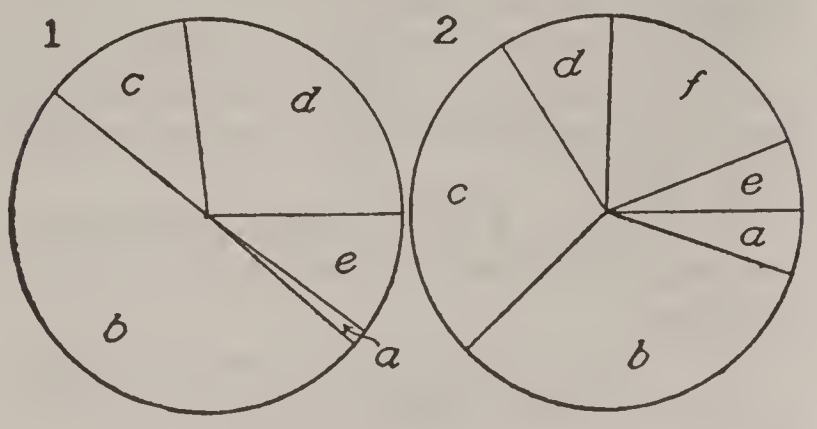
(5) The tax of a city given and the population known to find the average tax per individual.

The teacher or parent who learns to look for arithmetical problems in his every-day reading, will find much material of the kind indicated above. The child may be led to become awake to problems in his reading and may be encouraged to bring those real problems from the world about him into his school work and his home work in arithmetic. A.H.

DIVORCE, *di vohrs',* in law, is the dissolution of the marriage relation. Marriage, being a legal relation between a man and a woman, and not a mere contract, can be dissolved only by lawful authority, as after the relation is once formed the law holds the parties to various obligations and duties. It originates in the consent of the parties, but after once entered upon can be terminated only by the death of the husband or wife, unless sooner ended by the courts under general laws. Jurisdiction in divorce cases in the United States is usually conferred on the law courts by the statutes of the different states. In England previous to 1858 divorces could be granted only by an act of Parliament, but in that year certain courts were vested with limited power to grant divorce.

Causes for Divorce. In society of the early day the husband was given the right to repudiate his wife at pleasure or for slight cause, but with the improvement of moral and religious codes the divorce laws have now become more stringent. Among the causes for which divorces are generally granted are unfaithfulness; cruelty; wilful desertion for periods varying from one to three years; habitual drunkenness; failure to support; imprisonment for felony; gross immorality, and incompatibility of temperament. Under the laws of the Roman Catholic Church divorce is never permitted, as marriage is regarded as a sacrament and its clergy will not perform the ceremony for divorced persons, except by special dispensation.

In a number of Protestant churches divorce is regarded as justifiable only when the case is considered extreme.



CAUSES OF DIVORCE IN THE UNITED STATES

For any ten-year period within fifty years the reasons for seeking divorce have changed but little. The above diagrams relate to the period between 1906 and 1916:

1. Granted to husband: (*a*) drunkenness, 1%; (*b*) desertion, 49%; (*c*) cruelty, 12%; (*d*) adultery, 28%; (*e*) all other causes, 10%.
2. Granted to wife: (*a*) drunkenness, 5%; (*b*) desertion, 33%; (*c*) cruelty, 29%; (*d*) adultery, 10%; (*e*) neglect to provide, 6%; (*f*) all other causes, 17%.

Laws Governing Divorce. Laws governing divorce are widely different in various states of the American Union, and difficult questions are constantly arising in regard to the validity in one state of divorces granted in another. South Carolina does not permit divorces. By a change in its law in 1914 Nevada requires an actual residence of one year within the state, instead of six months, before either party may apply for divorce. This step was taken to lessen the influx of Eastern mismated people who found the Nevada laws the most lenient of any in the nation. In some states two, three or five years must elapse before divorced parties can remarry, while in other states there is no restriction. The wife, when she is granted a divorce, is usually allowed a stipulated sum, called *alimony,* payable at regular times, until she remarries or until the husband dies.

Ratio of Divorce. In the United States statistics show that the ratio of divorce is increasing, more divorces being granted, in proportion to population, than in Europe, and, as a consequence, there is a growing movement for even stricter laws upon the subject. Some students of the problem favor a national divorce law, to be enacted by Congress, hence affecting equally all parts of the country; others prefer more uniform laws throughout the several states, believing the evil can be regulated better by the states than by the nation. There is also a very widespread belief that more stringent marriage laws would very greatly decrease divorce.

Canadian Divorce Courts. By the British North America Act the Canadian Parliament has sole power to deal with the subject of marriage and divorce, and it alone can grant divorce by special legislation on each case from the provinces of Ontario, Quebec, Alberta, Manitoba and Saskatchewan and the Northwest Territories. In the provinces of New Brunswick, Nova Scotia and Prince Edward Island courts have power to annul a marriage for such causes as are stipulated by law. The supreme court of British Columbia holds that it possesses all the jurisdiction conferred on the English divorce court. Divorces in Canada are rare, totaling fewer than 100 a year among more than 7,500,000 people; in Prince Edward Island no divorce was granted from 1868 to 1912. A.E.R.

Consult Thwing's *The Family;* Lichtenberger's *Divorce: A Study in Social Causation.*

DIX, John Adams (1798-1879), an American statesman and soldier of wide reading and culture, especially famous for his services while Secretary of the Treasury in President Buchanan's Cabinet. He was born at Boscawen, N. H., saw service in the War of 1812 and remained in the army until 1826, when he resigned his commission as captain to study law. He was admitted to the bar in 1828 and filled many local and state offices, becoming Secretary of State in New York in 1833, and United States Senator in 1845.

While he was Secretary of the Treasury, government finances became more stable, and it was in that capacity that he issued his famous order, when a revenue cutter at New Orleans attempted to ignore his command to come to New York, "If any man attempts to haul down the American flag, shoot him on the spot."

At the beginning of the War of Secession he became brigadier-general and major-general of volunteers. In 1866 he was appointed minister to France, and in 1872 was elected governor of New York. Among other works he left several books relating to the city of New York.

DIX'IE, or **DIXIE-LAND,** a name popularly used to signify the Southern United States. The origin of the term is disputed. Some investigators claim it was derived from the Mason and Dixon's Line, which at one time roughly divided the free from the slave states. New York legends show that in the beginning of the nineteenth century it was the negro name for Manhattan Island, and signified to

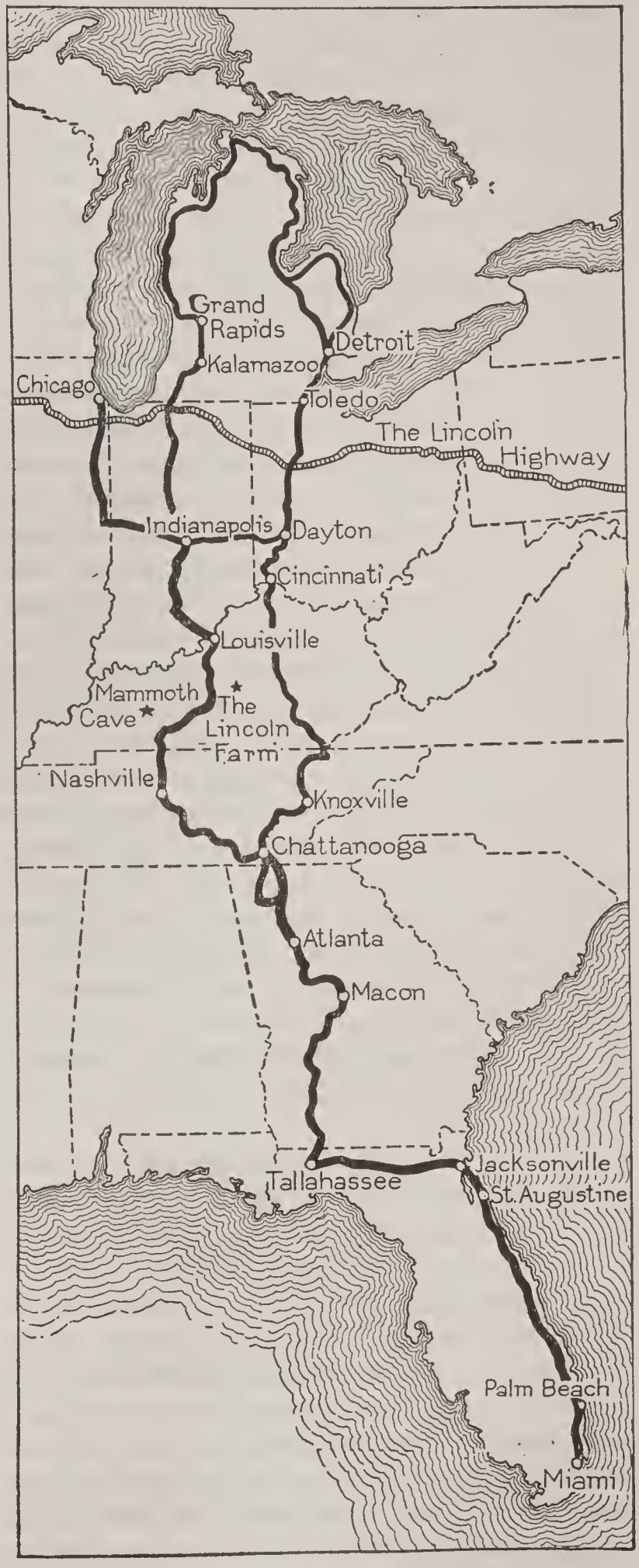
them a paradise on earth; for it was there that a man named Dixie owned a large number of slaves whom he treated well and permitted to enjoy many of the pleasures of life denied the negroes in some other sections. When abolition sentiment grew strong and he was obliged to send some of his negroes South, they regretfully left their Northern home, and sighed for "Dixie's land."

Whatever may be the truth as to this legend, shivering Northern negroes saying, "I wish I was in Dixie's Land," inspired Daniel Emmett to write the famous and immensely popular *Dixie,* the song of the Southland.

DIXIE HIGHWAY, an automobile roadway which will ultimately stretch from the strait of Mackinac, at the northern end of the southern peninsula of Michigan, to Miami, near the southern end of the peninsula of Florida. It is distinguished from other new American highways by its purpose. Travelers by automobile gain intimate contact with a country and its people, whereas travelers by train get only a picture framed by car windows; it is hoped that the Dixie Highway will add to the friendliness between the people of the North and the South which comes from familiar intercourse, and which decades of ordinary business interchange and tourist travel could never intensify. At present the North has more automobiles and will use the road oftener, but the South is displaying as great an interest. Its people want their Northern neighbors to see the New South, the prosperous, growing, enthusiastic "Dixie" of the twentieth century. Counties and towns along the way are constructing the pavement, a great part of which is cement, and the women of Georgia have started a movement for planting trees and flowers by the roadside.

Originally the northern end of the Highway was fixed at Chicago, and though the route to Mackinac will probably be popular, that to Chicago will undoubtedly prove to be the main-traveled road. The two ways meet at Indianapolis. Between Chattanooga and Mackinac the traveler has his choice of two roads. The western, through Nashville, Louisville, Indianapolis, thence to Chicago or South Bend, Kalamazoo, and Grand Rapids and along the shore of Lake Michigan, is the true Dixie Highway. The eastern, by way of Knoxville, Lexington, Cincinnati, Dayton, Toledo, Detroit and the shore of Lake Huron, will appeal to those who like to go and come by different routes. It will be easy to cross from one to the other along the Lincoln Highway, the Pike's Peak Highway or any of the other east-to-west roads.

An Historic Setting. There are many places of historical interest along the Dixie Highway,



ROUTES OF THE DIXIE HIGHWAY

most of them in the South. Just east of the main road at Elizabethtown, Kentucky, is the little farm on which Abraham Lincoln was born, now a shrine of the nation. At Chattanooga and Chickamauga are the scenes of great

struggles in the War of Secession, including the "Battle above the Clouds" and Missionary Ridge. For part of the distance between Chattanooga and Atlanta the route followed is that of Sherman's march to the sea. In Florida there are landmarks of a far earlier date, especially at Saint Augustine, where stands Fort Marion, begun over three hundred fifty years ago and held at different times by the soldiers of Spain, Great Britain, the United States and the Confederate states.

Scenery. As a scenic route the road is charming. The wooded dunes of Michigan, the corn lands of Illinois and the low hills of Indiana contrast sharply with the country farther south. In Kentucky the way of the western branch is through the cave region, and Mammoth Cave is not far to one side; the eastern branch traverses the blue-grass country. Through Tennessee the hills rise higher and higher, till at Lookout Mountain the traveler is over two thousand feet above the sea and fifteen hundred feet above the river beneath. In Georgia the cotton country is reached, then the land of lumber, turpentine and tar. Near Florida the live oaks and palmettos give a hint of the semi-tropical nature of the rest of the road, and along the coral-built east coast, Florida's Riviera, with its famous resorts, Saint Augustine, Daytona, Palm Beach and Miami, are seen groves of oranges, grape fruit, lemons and guavas, fields of pineapples, and banana trees and cocoanut palms. From Miami it is a short trip, by train and boat or by boat alone, to Havana, and when the roads of that island are improved, many Dixie Highway travelers will no doubt extend their journey into the tropic island.

History. The Dixie Highway was the idea of Mr. Carl G. Fisher of Indianapolis, who was also the founder of the Lincoln Highway movement. Governor Ralston of Indiana called a conference of the governors of all the states interested—Michigan, Illinois, Indiana, Ohio, Kentucky, Tennessee, Georgia and Florida—in 1915, and each governor appointed two commissioners, who made selections of roads and secured the coöperation of local authorities. At the outset much of the route was over roads of the worst type, but over five million dollars were spent in improvements the first year. There were said to be over half a million automobile owners in the territory served by the highway, including its branches, when active construction began; this number is now much greater. See LINCOLN HIGHWAY. C.H.H.

DIXON, THOMAS, JR. (1864-), an American novelist and playwright, who at one time was a preacher and lecturer. His works, strong and vital in parts, deal chiefly with the South and its negroes; they show vivid pictorial description and are in bold defiance of criticism. He was born in Shelby, N. C., was graduated from the Greensboro law school and admitted to the bar. In 1885 and 1886 he was a member of the North Carolina legislature, but resigned to enter the ministry, where he gained a reputation for freedom and originality of thought and powerful expression. He has also been a popular lecturer.

Among his writings are *The Leopard's Spots,* frankly dealing with the negro question; *The One Woman,* a story dealing with the divorce problem; *The Clansman,* picturing conditions in part of the South under the domination of the negroes and carpetbaggers during the Reconstruction period; *The Sins of the Fathers,* a gripping human-interest story which was dramatized and in which Dixon played the leading part; *The Southerner, The Victim, A Romance of the Real Jefferson Davis* and *The Foolish Virgin.*

The Leopard's Spots and *The Clansman* have also been dramatized, a very wonderful and stirring moving picture production having been adapted from the latter by D. W. Griffith, under the title *The Birth of a Nation.* After the latter task was accomplished Dixon wrote *The Fall of a Nation,* a story which owed its inspiration to the War of the Nations in Europe. In 1921 appeared *The Man in Gray.*

DNIEPER, *ne'pur,* the second largest river of Russia, rising in the government of Smolensk and after a winding course of 1,300 miles emptying its waters into the Black Sea through a mouth ten miles in breadth. Because of the benefits it brings to a large area it is held in great veneration by the Russian peasants, who call it *Father Dnieper.* It is navigable for almost its entire length, the rapids which formerly impeded the passage of ships having been remedied by blasting. As a commercial route the Dnieper is of the greatest value to Russia. Grain and lumber to the value of over $50,000,000 are annually borne on its waters to the Black Sea; the river flows through the heart of Russia's great "Black Belt," one of the world's most important wheat-growing districts. It abounds in fish, which are exported in great quantities. The Beresina, Pripet, Psiol, and Desna rivers are its most important tributaries. The Dnieper flows

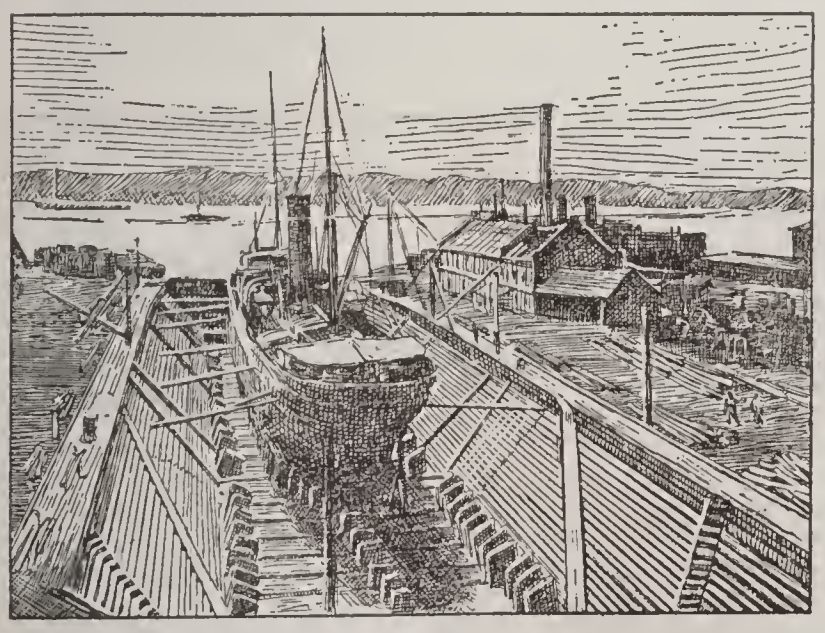
through highly cultivated agricultural districts and waters an area of 203,462 square miles.

DNIESTER, *nee'stur,* a river rising in the Austrian province of Galicia, flowing from the slopes of the Carpathian Mountains and emptying its waters into the Black Sea after a southeasterly course of 850 miles. More than 500 miles of its length is in Russian territory, and during recent years the imperial government has done much to increase commerce by dredging and blasting the river bed. It is now navigable from the Black Sea to Khotin, on the Russian frontier, and its boats carry great quantities of fish, lumber and grain to the sea. It flows through the western end of the great Russian wheat belt, one of the world's most productive grain centers.

DOCK, a large herblike plant of the buckwheat family, very troublesome as a weed throughout the United States. The roots of three species, however, the yellow, the broad-leaved and the yellow-rooted water dock, are used in tonics, as astringents, and especially for skin diseases. About 125,000 pounds of dock roots are imported into the United States each year, the price ranging from two to eight cents per pound.

The docks grow from two to four feet high and have long, large leaves, usually lance-shaped or heart-shaped, sometimes with very heavy margins. The flowers are small, greenish and inconspicuous.

DOCK. To say, "He fell off a dock" is no more correct than to say, "He fell off a hole," according to authorities on the usage of words. Yet to most people in America a dock is a



AT DETROIT, MICHIGAN
A type of the ordinary dry-dock.

wharf, a structure alongside of which boats may be fastened. This local perversion of the word probably arose from the circumstance that in America there are almost no true docks —enclosures in which ships may be anchored while in port, the dock being the basin containing the water which floats the ship. In Europe such docks are well known. They are most valuable at shipping points where the tide rises and falls many feet. At Liverpool, for instance, the River Mersey is lined for miles with enclosures whose gates may be closed to retain water for ships when the tide goes out.

Dry-Docks. When a dock is built so that the water in it can be pumped out, it is called a dry-dock. Ships needing repairs beneath their water-lines may be towed into it and braced in position before the water is withdrawn. *Floating dry-docks* are steel shells which can be raised or lowered, like a submarine, by pumping water out or in. One may be made to sink until its floor is low enough to permit a ship to enter, and then raised until the ship's keel is out of water. Probably the most famous floating dry-dock is the *Dewey,* which was constructed in 1905 and successfully towed from Maryland to the Philippine Islands.

DOCKYARDS, government establishments in which warships are built, repaired and fitted out with all required stores. There are eight of these establishments, officially called *navy yards,* in the United States. Two are on the Pacific coast, at Puget Sound, Wash., and Mare Island near San Francisco, Cal. The other six are on the Atlantic coast, at Portsmouth, N. H., Boston, Mass., Brooklyn, N. Y., Washington, D. C., Norfolk, Va., and Philadelphia, Pa. The principal British dockyards are at Portsmouth, Devonport, Sheerness, Chatham, Queenstown and Pembroke. Canada has well-equipped dockyards at Halifax, Nova Scotia, and Esquimalt, B. C., for the convenience of warships of Great Britain.

DODDER, *dod'er,* a twinelike parasite plant, native of Europe, but found in June and July in the United States south and west from New York as far as the Rocky Mountains. It starts from the ground, living on the starch stored in the seed. Then its pale-yellow, fine, leafless stems twine on other plants and hold on by means of rootlets or suckers. It then breaks loose from the soil and feeds on the plant to which it is attached. These thread-like stems form a tangled mass and later produce dense clusters of small white flowers.

Dodder is very destructive, especially to flax, clover and alfalfa. The best prevention is careful examination of seed before planting. Dodder seed is a little smaller than clover seed and can be screened out if sufficient care

is used. The best cure is burning the infested places before the dodder seed matures. See illustration in article BOTANY, page 859; also FUNGI; PARASITES.

DODGSON, *doj'son,* CHARLES LUTWIDGE (1832-1898), an English writer who is known to countless readers by his pen name of LEWIS CARROLL, which appears on the title pages of two of the most charming and original stories for children ever written—*Alice's Adventures in Wonderland* and *Through the Looking Glass.* He was accustomed to use his real name when he published his various learned books on mathematics, for he was a mathematical lecturer at Christ Church, Oxford University, from 1855 to 1881.

During his lectureship at Christ Church he became the well-beloved companion of the three little daughters of the college dean, Lorina, Alice and Edith Liddell, and the *Wonderland* adventures of Alice are the stories he told the children on some of their afternoon boating excursions on a pretty little river of the town.

As examples of delightful nonsense, the *Alice* books are in a class by themselves, and their charm has been increased by the pictures drawn for them by one of England's greatest cartoonists, Sir John Tenniel. His portraits of the Cheshire Cat, the Mad Hatter, Tweedledum and Tweedledee and all the other picturesque companions of Alice in her wanderings in the land of adventure are an inseparable part of the narratives themselves. Dodgson wrote several other stories for children, among which are *The Hunting of the Snark, Rhyme and Reason* and *Sylvie and Bruno.* See ALICE'S ADVENTURES IN WONDERLAND.

DODO, *doh'doh,* a bird no longer in existence, but once related to the pigeons. It is known only from descriptions of Portuguese and Dutch voyagers and from specimens in the British Museum. The dodo was a clumsy

SKELETON OF THE DODO
Dotted lines represent the form of the bird.

bird, larger than the swan, covered with grayish down, and with a tail appearing like a tuft of curled feathers. It walked very slowly on short, ill-shaped legs, and as its wings were too short for flight, it was easily captured. Its appearance and actions gave it the name, which means *simpleton.* The dodo was at one time abundant on the islands of Mauritius and Bourbon, but as it was valued as food by visitors and was also captured by hogs the sailors turned loose, the genus became extinct.

DOG, a faithful, courageous and intelligent domestic animal, to which no truer or more simple tribute could be made than the following eulogy by Former Senator George Graham Vest:

The one absolutely unselfish friend that man can have in this selfish world, the one that never deserts him, the one that never proves ungrateful or treacherous, is his dog. A man's dog stands by him in prosperity and in poverty, in health and in sickness. He will sleep on the cold ground, where the wintry winds blow and the snow drives fiercely, if only he may be near his master's side. He will kiss the hand that has no food to offer, he will lick the wounds and sores that come in encounter with the roughness of the world. He guards the sleep of his pauper master as if he were a prince. When all other friends desert, he remains. When riches take wings and reputation falls to pieces, he is as constant in his love as the sun in its journey through the heavens. If fortune drives the master forth an outcast in the

THESE NEVER WERE TRAITORS

world, friendless and homeless, the faithful dog asks no higher privilege than that of accompanying him to guard against danger, to fight against his enemies. And, when the last scene of all comes, and death takes the master in its embrace, and his body is laid away in the cold ground, no matter if all other friends pursue their way, there by his graveside will the noble dog be found, his head between his paws, his eyes sad but open in alert watchfulness, faithful and true even to death.

Origin. The earliest date of domestication of the dog is a matter of dispute, but he was the companion of man before history was first recorded. There is no doubt, however, that dogs are the descendants of several different kinds of wolves and jackals. Various breeds of dogs are now found everywhere, except perhaps in New Zealand. They serve the cannibals of the Pacific islands, the Eskimos of the frozen north, the red men of the prairies and the white men of all civilized cities of the world. A few of the habits of their wild ancestors of the jungles and plain are still retained by the dogs of the household, such as digging up the earth with their forefeet and throwing it back with the hind feet, and turning around two or three times before lying down. If left to themselves some kinds of dogs would no doubt again become wild, as did the dogs left on Robinson Crusoe's island and as did the noble beast in Jack London's *Call of the Wild.* They would lose their bark, which observers consider an attempt to imitate the human voice, and would merely yelp and howl. Wild dogs are found in Southern Asia and in the islands of the Pacific. In Australia one species, a destroyer of sheep, is known as the *dingo.* The wild dog of India is the *dhole,* about which Kipling has written.

Breeds and Characteristics. There are about two hundred breeds of domestic dogs, which vary greatly in size, appearance and structure. All, like the cat, have five toes on the forefeet and four on the hind feet, but the claws are duller, shorter and not retractile, that is, cannot be drawn back into the toes. All earn their keep for some special service to the master, ranging from mere companionship, affection and devotion to the protection of life and property. All the important breeds of dogs are described in separate articles in these volumes, and a list of these will be found under the heading *Related Subjects* at the end of this article.

Dogs That Work. In snow- and ice-bound northern lands dogs play an important part in the activities of man. In Alaska, sled dogs and reindeers are employed almost entirely for transportation. Dogs which are half wolf, called *malamutes,* are harnessed to sleds in a line, one before the other. Those dogs are thievish and are fierce fighters, however, and the Labrador *huskies,* a longer-legged, more efficient cross-bred dog, is taking the place of the malamutes. These "huskies" are harnessed abreast so they spread out in a fan-shaped team. Usually seven or nine dogs make such a team, and the burden for each is about 150 pounds. Many dogs are in the employ of the United States government in Alaska, carrying mail.

One of the interesting sights in Belgium is the little shop and vegetable market on wheels. Here and there on city corners, on a pleasant day, dog-drawn carts are seen, filled with wares to be sold to the passer-by (see page 665). In other European countries dogs earn their living in many unusual ways. As members of the armies, the dogs of war are trained as sentries, messengers, scouts and ambulance dogs. They search the battlefield for the wounded and missing, and in this work are invaluable, for they do not need light and can do the work by night, merely by scent. These animal Red Cross helpers bear flasks of brandy or soup and a roll of bandages about their necks for the relief of wounded men. By following the tinkle of bells on the dog's neck, stretcher bearers know where to go, and a low whine from the dog announces that a man has been found.

Hounds are employed in police departments of many large European cities, where they aid in capturing criminals. The use of various kinds of dogs as hunters of game is well known everywhere. The collie is a famous shepherd dog, and is described under its title. Stories about the rescuing of lost travelers in the Alps by the great Saint Bernards, and the saving of the drowning by those strong swimmers, the Newfoundlands, are numerous, interesting and true. It is said that one Saint Bernard called "Old Barry" rescued forty-two men in the Alps—truly a medal-deserving hero.

Dogs, too, have served in the cause of humanity. An English dog, called "Help," traveled

on railway trains for three years, bearing an inscription on his collar, "I am Help, the railway dog of England, and traveling agent for orphans of railway men who are killed on duty." Within those three years he collected more than $2,500, never failing to bring his collar-bank safely to his masters.

Training and Care. Not only can various breeds of dogs be trained to hunt, but even the mongrel pet of the household has intelligence keen enough to be taught various tricks —to beg, to "speak," to fetch, carry and do various simple acrobatic feats. A sharp reproof will be more effective than blows, and a kindly word will bring forgetfulness of former harshness and will call forth that sign of devotion, a grateful wag of the tail.

Cleanliness and freedom from draughts are as necessary to the dog as to man; these will guard against the disease known as distemper (which see). To remove fleas, that burden of a dog's life, careful bathing is necessary. Under favorable circumstances a dog will live for fifteen years. Even with the best of care, however, it is liable to disease. The worst of these is rabies, or hydrophobia (see HYDROPHOBIA). If a human being is bitten by an animal suffering with rabies, the disease will be imparted to the person bitten.

A dog can go longer without meat than without water, so his special water-pan should always be kept filled. One meal a day for a grown dog is considered sufficient; that may be of dog biscuit or the coarse scraps from the table, with not too much meat. A dog, to look best and to show most intelligence, should be neither fat nor lean, but just sleek. The occasional bone should not be forgotten, for gnawing on a bone keeps the dog's teeth sharp, and forms part of its amusement, too. Who has not watched a dog carefully bury its bone and then later seen another unearth it?

Outlines for Essays on the Dog

The Dogs I Pass on My Way to School

(1) The distance I walk
(2) The number of dogs I pass
(3) The "next-door" dog
  (a) His appearance
  (b) How he shows his pleasure at sight of me
(4) The biggest dog I see
  (a) Where he lives
  (b) His appearance and name
  (c) How he greets me
(5) The smallest dog I see
  (a) How he watches for me at the window
  (b) His shrill bark
  (c) His courage
(6) The dog that follows me to school
  (a) How he shows his liking for me
  (b) Why I like him best

A Conversation Between a Poodle and a Saint Bernard

(1) The poodle speaks
  (a) Pride in my appearance
  (b) The many things I cannot do
  (c) My contempt for "rough" dogs
  (d) What I like best
    1. My warm corner
    2. My soft cushion
    3. My dainty food
    4. The ride with my mistress
(2) The Saint Bernard speaks
  (a) My birthplace in the Alps
  (b) My home in the hospice of Sain Bernard
  (c) The great snowstorms
  (d) How I was fitted out for my rescue work
  (e) The hunt through the blinding snow
  (f) The joy at finding a traveler
  (g) My pride in my strength

Dog Laws. In nearly all large cities there are laws specifying the terms on which dogs may be kept and allowed to run at large, and most of them impose a license, or tax, on dogs. A dog may be killed in self-defense, or after notice to the owner that he is a menace to the community. Societies for the prevention of cruelty to animals have been organized in most countries, and in many places they have erected homes for stray dogs. V.L.K.

Dog Books. In addition to Jack London's *Call of the Wild,* Oliphant's *Bob, Son of Battle* must be mentioned as one of the best dog stories in print. Brown's *Rab and His Friends,* Richard Harding Davis' *The Bar Sinister* and Ouida's *A Dog of Flanders* are classics among short stories. There are many dog fables and poems. Among the latter two well-known ones are Goldsmith's *Elegy on the Death of a Mad Dog* and Trowbridge's *The Vagabond.* In *Oliver Twist* is the story of Bill Sikes and his dog. See, also, Hodge's *Nature Study and Life, The Dog in History and Folklore* in *Sketches and Studies* by R. J. King, and Watson's *Dog-Book.*

Related Subjects. The following breeds of dogs are given separate treatment in these volumes:

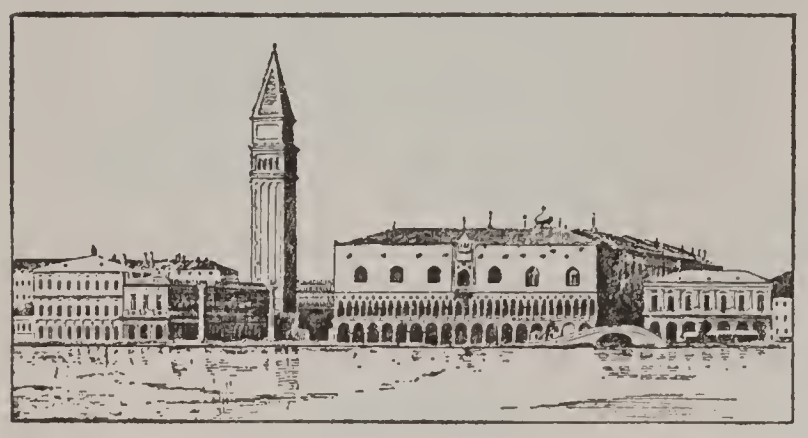
Bloodhound	Pointer
Bulldog	Poodle
Collie	Pug
Dachshund	Retriever
Dingo	Saint Bernard
Eskimo Dog	Scotch Terrier
Foxhound	Setter
Fox Terrier	Shepherd Dog
Great Dane	Skye Terrier
Greyhound	Spaniel
Hound	Spitz
Mastiff	Staghound
Newfoundland	Terrier

DOG'BANE, a milky-juiced American shrub growing near meadow borders from Canada to Carolina. The spreading dogbane, or *honey-bloom,* has light green leaves and clusters of pale pink bell-shaped flowers. Its root is very bitter and is used in place of ipecac to cause vomiting. The other species, known as *Canada* or *Indian hemp,* has paler flowers, crowded together, and its bark yields a long and strong white fiber, which is used for making nets. Dogbane was at one time believed to be poisonous, but it may be eaten without harm by cattle in pastures or prairies.

DOG DAYS, a period in summer usually characterized by being the hottest days of the year. The name was first applied by the ancients to the time of the rising of the dog star Sirius; it covered a period of about forty days in the hottest season of the year. That star now rises at a different time, but the hot, sultry summer days are still called the *dog days.* As dogs usually suffer in hot weather and sometimes go mad and cause injury by the bites they inflict, in large cities laws require that they be muzzled. So, from that fact it has often been incorrectly believed the term originated. It is interesting to note that dogs contract the disease which makes them "mad" more frequently in cold than in hot weather.

DOGE, *doje.* As in the United States the President rules the nation as the Chief Executive, so in the republics of Venice, Amalfi and

Genoa in the year 697 and for several centuries the *doge* was the chief ruler. Amalfi soon dropped this form of government; but up to the twelfth century the doge, although elected



THE DOGE'S PALACE

In the center, at right of the campanile, or bell tower.

by the people, ruled with almost absolute authority in Venice and Genoa. The word is derived from the Latin word *dux,* meaning *leader.* The men chosen as doges were usually from the powerful families, and they often tried to have their sons succeed them. The people resisted this succession until the twelfth century, when a famous Great Council of 480 members was created. From this group the members elected the doge, and his powers were greatly restricted. In both republics the office disappeared when the French conquered them in 1797.

Doge's Palace. On the banks of a canal in Venice is a quaint three-story palace which has been there since 1300. This was the home of all the late doges, and it was the meeting place of the Great Council. When it was first built, prisoners were kept in dungeons beneath. Later a prison was built on the other side of the narrow canal, and a bridge known as the "Bridge of Sighs" connected it with the palace (see page 925). The tragic fame of this bridge arose from the shortness of the passage from the palace of beauty and power to the dark, dismal dungeons. Much of the building has suffered from fire, but many beautiful pieces of sculpture and painting still remain in the halls. Ruskin in his *Stones of Venice* gives an account of the atmosphere and grandeur of the palace, with its numerous historic associations.

DOG'FISH, a name commonly given to several small species of the shark family. They are said to follow smaller fish, on which they prey, in packs like hounds on the trail, and from this fact the name was doubtless applied. These fish are found in all parts of the North Atlantic and are greatly detested by fishermen, as they break nets and even take fish from hooks. None of the species can be considered as very palatable food, but in the north of Scotland they are dried and kept for winter use. Dogfish vary greatly in size, but the largest seldom exceed three feet in length. The dried skin of one species is used for polishing wood, and on the Pacific coast of North America dogfish are captured in large numbers for the oil which is extracted from the livers. The small bowfin, or amia, found in the rivers of the United States and Canada, is sometimes called a dogfish. It deposits its eggs in a nest, and bravely defends its young.

DOG STAR. See SIRIUS.

DOG-TOOTH VIOLET, or ADDER'S TONGUE, is really not a violet, neither does it resemble a dog's tooth nor a snake's tongue. It is a plant of the lily family, is found in the early spring along the cool, moist sides of trout streams, and is sometimes more appropriately called *trout lily.* It flowers from March through May in north temperate regions. Two smooth leaves, mottled with purple and white,

DOG-TOOTH VIOLET

spring from the bulb. And between them, on a six- to twelve-inch stem, nods the yellow, purplish or white bell-shaped flower, with its tuliplike fragrance. It is one of the spring flowers of the Northern states and Canada which breaks through the ground early to catch the sunshine before the leaves appear on the trees to darken the ground.

DOHERTY, *do her' ti,* CHARLES JOSEPH (1855-), a Canadian jurist and legislator and Dominion Minister of Justice after 1911. He was born at Montreal, where he attended Saint Mary's College and McGill University. He was admitted to the bar in 1877; from 1891 to 1906 was judge of the superior court of the

province of Quebec, and served as captain of the sixty-fifth battalion during the Riel Rebellion in 1885. He was appointed professor of civil and international law at McGill University in 1890, and retained this position for more than twenty years. He was elected as a Conservative to the Dominion House of Commons in 1908, and in 1911 was made Minister of Justice in the Borden Cabinet.

DOL'DRUMS. On the ocean near the equator are localities where alternating calms, squalls, and dry, baffling winds make it difficult to navigate a boat. Sailors fear and avoid these places, so far as possible, calling them the *doldrums,* meaning *dullness.* They seem to move north in July and south in January, having clouds, caused by the trade winds, hanging over them. It was not until the publication of complete charts of the ocean that vessels were able successfully to steer away from the glassy surface of the ocean in these parts.

Applied to persons, to be *in the doldrums* infers a condition of listlessness.

For a list of winds under varying names, see the article WIND, in Volume VIII.

DOLE, *dohl,* NATHAN HASKELL (1852-), an American author who has won distinction as an editor, translator and writer of both prose and poetry. After his graduation from Harvard College in 1874 he taught for several years, and in 1881 became musical and literary editor of the Philadelphia *Press.* Later he acted as literary adviser of publishing houses in New York. Dole's original works include *Famous Composers; The Hawthorne Tree, and Other Poems; Joseph Jefferson at Home; Alaska; Life of Count Tolstoi,* and *The Spell of Switzerland.* Among his translations are Tolstoi's *Anna Karenina,* Daudet's *Tartarin on the Alps,* Verga's *Cavalleria Rusticana, Memoirs of Baroness von Suttner,* and hundreds of songs from various languages. He has also edited many collections of prose and verse, including Tolstoi's works and a comprehensive edition of *The Rubaiyat of Omar Khayyam.*

DOLE, SANFORD BALLARD (1844-), an Hawaiian statesman who has held many prominent offices in the former republic and present territory of Hawaii. He was born at Honolulu, of American parentage, and was educated at Williams College (Mass.). He was admitted to the bar in Boston; returning to Hawaii, he was made judge of the Supreme Court in 1887. After the revolution of 1893 which deposed the queen, he became President of the provisional government and in the following year was chosen President of the republic of Hawaii. Largely through his influence as a strong advocate of the annexation of Hawaii to the United States, the islands were converted into a territory, and he became its governor in 1900. Resigning in 1903, he was appointed United States district judge of the territory. See HAWAII.

DOL'LAR. In the United States and Canada the silver or gold coin whose value is 100 cents is called a dollar. In 1792 the Coinage Act was passed which established the dollar as the basis of the American monetary system. This was copied after the Spanish dollar then in circulation among the colonies, but the name is derived from the Dutch *daler* or German *thaler.* The first United States silver dollars were made in 1794 and continued to be coined until 1905. These are still largely circulated in the western part of the country, but people in the East object to their weight, and demand paper dollars, whose value is guaranteed. By an Act passed on March 14, 1900, the gold dollar, weighing 25.8 grains, nine-tenths pure gold, was made the standard dollar in the United States, but no provision was made for coining it. See MONEY; COINAGE.

DOLLS, PAPER. Happy is the little girl who has a pair of scissors, a few pieces of colored papers and ten nimble fingers, for with these tools and materials she can spend many delightful hours. She need not depend upon the sets of paper dolls sold in the toy shops, for out of plain white paper she can cut her own dolls, and out of colored papers she can plan and make most interesting costumes.

Fig. 1 shows a 4½″ x 6″ piece of cream-colored paper, folded in the middle. (The symbol (″) stands for *inches.*) It will be best to practice on bits of folded newspaper until you can cut the half-shape of a doll to look like Fig. 2. The doll shape, when unfolded, should look like Fig. 3. With a lead pencil, draw carefully the eyes, nose and mouth, copying from Fig. 3. The shape of the hair can be cut from light or dark brown paper (Fig. 4) and pasted in place. Dolly is now ready to be dressed.

From your sheets of colored paper, choose the material for a dress. Shall it be blue, brown or white? Fig. 5 shows a piece of blue paper cut 3″x6½″. It is folded in the middle, as both sides of this first little dress are to be alike. Fig. 6 shows the shape of the neck cut out from the folded edge and one of the folded corners snipped off. Fig. 7 shows the little dress completed.

PAPER DOLLS

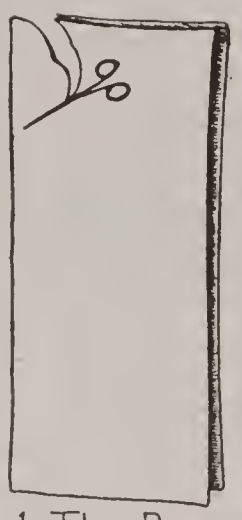


Fig. 1-The Paper Doll. 4½ X6" Cream Manila Folded on Long Diameter. Free Cutting.

Fig. 2

Fig. 3-Cutting Completed

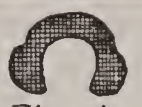


Fig. 4
Shape of Hair Cut from Brown Paper

Fig. 5
The Doll's Dress 3X6½ Blue Paper Folded on Short Diameter. Free Cutting.

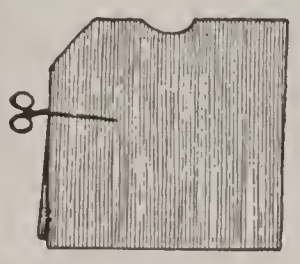


Fig. 6

Fig. 7
Doll's Dress Completed

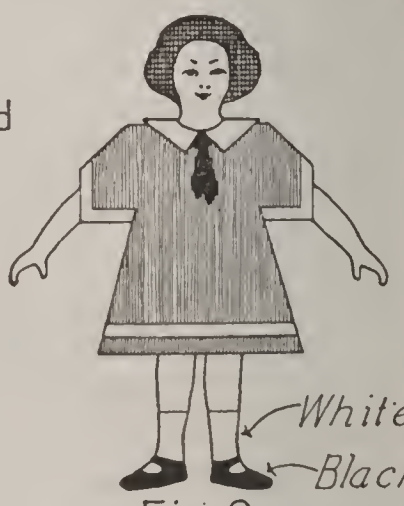


Fig. 8
The Paper Doll Wears a Paper Dress.

Fig. 9

Fig. 10

Fig. 13

Fig. 11

Fig. 12

Five Different Ways of Trimming the Same Dress

PAPER DOLLS

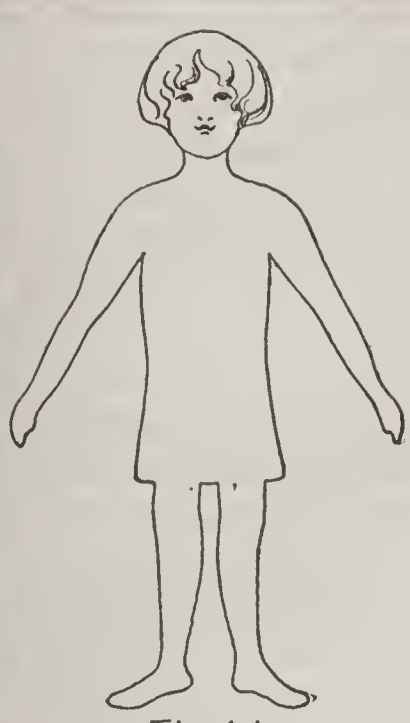


Fig. 14
A Boy Doll Cut from Paper

Fig. 15

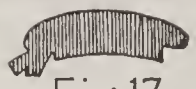


Fig. 17

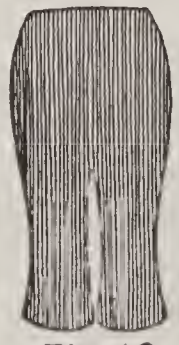


Fig. 16

Fig. 18

Fig. 19

Fig. 20

Fig. 21
Scotch

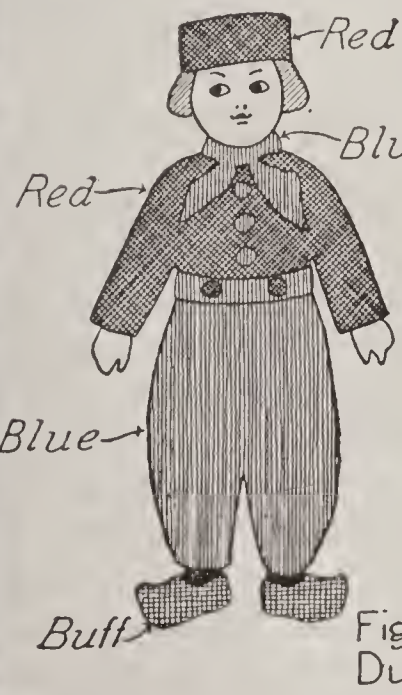


Fig. 22
Dutch

Fig. 23
Chinese

Fig. 24
Spanish

Now comes the pretty part. The little dress can be trimmed in a number of ways. In Fig. 8 a white collar has been cut from paper and pasted in place. White strips of paper have been cut for bands, and pasted to the bottom of the dress and sleeves. Charming little shoe shapes were cut from black paper, and sock shapes from white paper. These shapes were pasted over the feet and legs of the doll. Dolly can change her dress, but she must always wear the same shoes and socks. A ribbon hair-bow and necktie add the finishing touches to this charming costume.

Five more ways of cutting and of trimming dresses for paper dolls are shown in Figs. 9, 10, 11, 12 and 13.

No paper doll family is complete without some boys. Their costumes are of more sober colors than the costumes of girls, but the styles and shapes are interesting to cut. A sailor costume for a boy can be cut from dark blue and white papers.

Fig. 14 shows a boy doll cut from cream-colored paper. The process of cutting out this shape is the same as is shown in Figs. 1, 2 and 3. Figs. 15 and 16 show the blouse and trousers cut from dark blue paper. A white collar and a black tie, both cut from paper, have been added to Fig. 15. The cap is shown in Fig. 17. The Sailor Boy cannot change his costume, because the clothes must be pasted to the figure. It would be interesting to cut a number of boy dolls and dress them in different costumes. Figs. 18, 19 and 20 show three different costumes that can be cut and pasted on three different boy dolls.

Paper dolls may be dressed in the costumes of other nations. Is it not strange that we can represent, by means of cut papers, shoes, hats, caps, dresses, parasols, sashes, neckties and everything that is worn? If the shapes are true and the colors harmonious, these costumes will be as beautiful as painted designs.

Fig. 21 shows a boy doll dressed in a Scotch costume. The kilt skirt and the sash are cut from plaid paper. You can make your own plaid by drawing lines, carefully spaced, on green, gray or blue paper, with colored crayons. Use a ruler, and see that the points of the crayons are sharp. Cover a sheet of 6″ x 9″ paper with the plaid design, and then cut from the sheet the shapes of kilt and sash, and the band for the cap. The stockings could be cut from gray paper, with dark red lines drawn afterward upon the shapes, to look like "cross gartering."

The Dutch Boy (Fig. 22) is easy to dress. His wide trousers, his quaint cap and his wooden shoes can all be cut from the colors that are printed on the drawing. All of these shapes should be cut from folded papers, so both sides of the shapes will be exactly alike.

The little Chinese lady, with her kimona and parasol, makes a most attractive doll. Her black hair can be cut from black paper, her kimona from violet tissue that looks like silk, and her parasol from green paper, with small pieces of red paper used for a decorative pattern.

Fig. 24 shows a Spanish boy, arrayed in the splendor of black velvet and gorgeous color. Cut the trousers and coat from folded paper, as these shapes are to be alike on both sides. The sash and the ribbon bow on the cap must be cut from single thickness of paper, as they are irregular in shape. After you have made these paper doll costumes from the sketches, you should invent some costumes of your own or work some paper costumes in colors, from pictures that you find in other books. B.S.

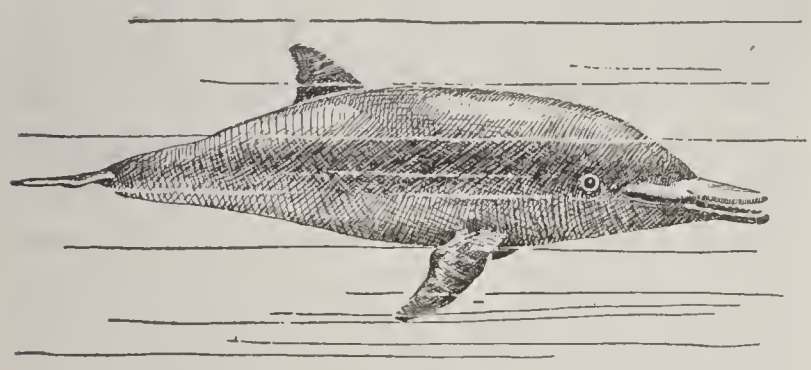
DOL′OMITE, a rock composed of limestone and a compound of magnesium and carbonic acid. It is sometimes called *magnesium limestone.* The purest varieties, when crystallized, are known as *pearl spar;* this has crystals with curved surfaces and is of a pearly luster. Dolomite varies in color from yellowish-white to yellowish-brown and gray. It occurs in large masses in Europe, where great mountains in Switzerland, Austria, Italy and England are formed almost wholly of dolomite. In the United States it is found in the New England States, Eastern New York, Georgia and Tennessee. Some of the finest statuary marble is dolomite. Another variety, called *bitter spar* or *rhomb spar,* is gray, yellow or reddish-brown, and is partially transparent. Dolomite is a good building stone, but the common variety does not take a polish. See LIMESTONE; MARBLE.

The Dolomites, a section of the Alps on the border between the Austrian Tyrol and the Italian province of Venice. Composed of the comparatively soft mineral known as dolomite, these mountains have been carved by the winds and rains and frosts into every sort of fantastic shape. John L. Stoddard has called them "the Alps in ruins" and compared their appearance to "castles, citadels, cathedrals, obelisks, towers, pyramids, chimneys, needles, bayonets, tusks, and other grotesque and distorted shapes, to name which all the languages

devised by man are insufficient." The tallest of the peaks is Monte Marmolata, whose summit rises 10,972 feet above the sea. On the southern slope of the mountains lie Pieve di Cadore and Cortina d'Ampezzo, both of which claim to be the birthplace of Titian, and both of which figured in the War of the Nations. For eight centuries before Napoleon there was a republic of Cadore, which was allied to Venice, and in the days of the Little Corporal's greatness the masts for its ships and the piles which supported the city were larches and pines from the Dolomites.

DOLPHIN, *dol'fin.* In all tropical and temperate waters of mid-ocean the traveler on shipboard often sees flashes of brilliant green, which shoot along rapidly, turning hither and thither. "Dolphins!" someone cries, and eyes are strained to catch a glimpse of those beautiful olive-green marine animals. The lower part of the body is golden, but the smaller dolphin, which does not grow over two and one-half feet long, is sea-green, with a silver covering on the lower part of its body. The large dolphin, which reaches a length of about six feet, is liked by sailors as food.

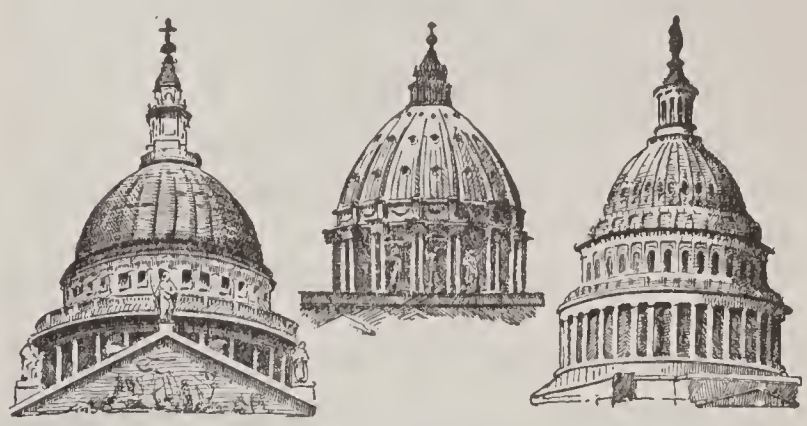
These strong, rapid swimmers, traveling in schools, gather around a ship and delight the passengers with their graceful motions. Up they dart, many feet into the air, and back



Ere the dolphin dies
Its hues are brightest. Like an infant's breath
Are tropic winds before the voice of death.
—*Fitz-Greene Halleck.*

again into a wave, shooting so quickly that they leave a narrow white streak behind them in the water. They seem like mermaids of the sea as they play in the water, and many old legends about them were written by the Greeks. The dolphin was sacred to Apollo and was put on many ancient coins and medals. When dying, the dolphins change their color to many brilliant shades, which poets have often celebrated.

DOME, *dohm,* in architecture, a hemispherical or angled roof, shaped like an inverted bowl. The word is derived from the Latin *domus,* meaning a *house,* or *home.* A dome may be constructed of various materials, such as stone, brick, wood or earthenware. This form of roof is of ancient origin, having been first used in the Byzantine Empire. At that time there was no way known by which a round roof could be placed on any other than a round building. That difficulty, however,



DOMES

At left, Saint Paul's, London; center, Saint Peter's, Rome; right, the Capitol, Washington, D. C.

was overcome, and the Church of Saint Sophia in Constantinople was the first rectangular building to be capped by a dome (see page 325). This was done by means of pendentives (which see), and that style of architecture immediately became popular.

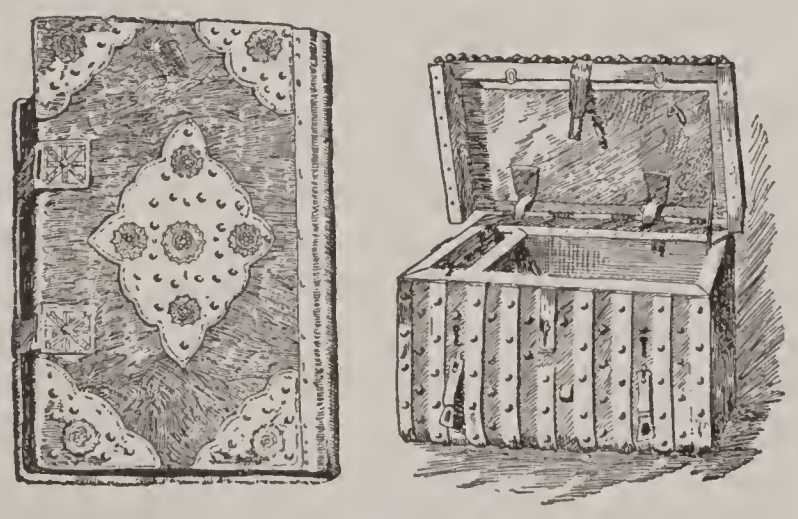
The dome was the usual style of roofing for Arabian tombs and mosques. It was copied in India, where it was soon recognized as a distinctive style of Mohammedan architecture. One of the most beautiful domes in the world surmounts the Taj Mahal (which see) at Agra, and one of the largest is the roof of the tomb of Mahmud at Bijapur. The most noteworthy domes are those on Saint Peter's, Rome; Saint Paul's Cathedral, London; the Hotel des Invalides, Paris; the Capitol at Washington, and the capitol, Madison, Wisconsin. Far surpassing all others in existence, ancient and modern, is the famous dome of the Pantheon at Rome, 140 feet in diameter and 143 feet high. The largest dome ever constructed, however, was a temporary one, on the Palace of Horticulture at the Panama-Pacific Exposition at San Francisco in 1915. It was 152 feet in diameter and 185 feet high, and its huge steel frame was roofed over with glass. It was torn down at the close of the exposition.

DOMENICHINO, *do may ne ke'no,* (1581-1641), an Italian painter, one of the most eminent pupils of the Carracci, who established at Bologna, in about 1580, the first modern academy of art. His earliest notable work was done in Rome, where he painted his masterpiece, *Last Communion of Saint Jerome.*

This canvas now occupies a place in the Vatican, opposite Raphael's *Transfiguration.* While in Rome he also produced several fresco painting of religious and mythological subjects. Between 1617 and 1621 he lived in Bologna, the most important production of this period being his *Modanna of the Rosary.*

In 1621 Pope Gregory XV recalled him to Rome to become chief painter and architect of the Papal palace, and ten years later he was commissioned to decorate with frescoes a chapel of the cathedral at Naples. The best works painted during his second visit to Rome are the *Four Evangelists* and a charming mythological picture, *Diana and Her Nymphs Bathing.* Domenichino excelled in landscape and fresco painting, using landscape effectively as a background, and he has been highly praised for the naturalness of his scenery and for the lifelikeness of his human figures.

DOMES'DAY BOOK, or **DOOMS'DAY BOOK,** one of the most interesting historical volumes in existence. When William of Normandy conquered England in 1066, he rewarded his followers by giving them land



DOMESDAY BOOK AND CHEST

There are two large volumes of the survey, one being a folio of 760 pages, the other a larger octavo of 900 pages. The strong box shown in the illustration is the chest in which the volumes were once kept.

The picture above is from a drawing made from a *facsimile* edition published by command of Queen Victoria in 1862.

which had previously belonged to the conquered people. Wishing to know how the country was peopled, how much land belonged to the king himself, and how the rest of the land was partitioned, he caused a survey to be made. Each landowner or holder was requested to give to the king's commissioners full particulars concerning the land he owned or held and of property of every kind he possessed.

The country was divided into districts, each district furnishing as census-takers, so to speak, a certain number of men familiar with the disposition of land and property, to assist the king's commissioners. The result was a complete return of all details concerning land and property in that part of England controlled by William. His authority did not extend far enough north to include Northumberland, Cumberland, Durham or Westmoreland. All information gathered, in some instances even to the number of sheep and swine, was published in the Domesday Book, against the record of which there was no possibility of appeal. There are many families in England who find cause for pride in the fact that their family name appears in the Domesday Book among those of landowners, Perfect facsimiles of the original Domesday Book were published in 1861 and 1865. See WILLIAM I, THE CONQUEROR.

DOMESTIC, *do mes' tik,* **ART.** Grandmother has told you many stories about the good old days when she was a little girl.

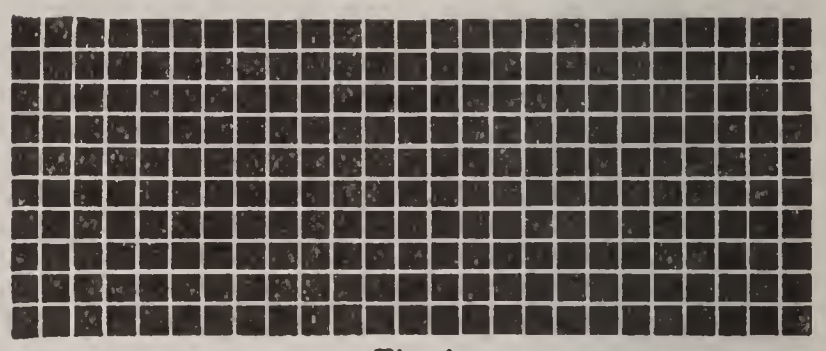


Fig. 1

Grandmother's mother was a fine, old-fashioned woman, who thought that little girls should be taught to cook, to sew, to knit, and to do everything that is necessary to be done about a house. The schools where Grandmother and her little friends learned to "read, write and cipher" had no classes in sewing or cooking, for mothers were expected to teach these subjects to their daughters at home.

You have heard of the long seams that had to be sewed, of the patch-work blocks that had to be finished before the little girl whose name is now Grandmother could go out to play. Perhaps, when you listened to these stories, you felt sorry for the children of long ago, whose mothers insisted that lessons in sewing and knitting and other forms of hand

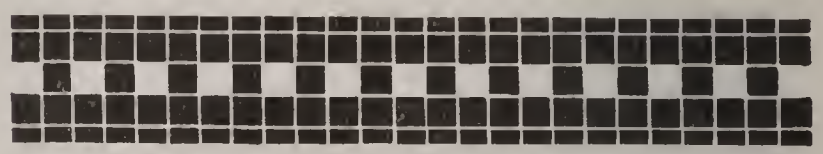


Fig. 2

work must be learned and learned well. But people have grown to think that such training is most important, and that it can be made very interesting.

It is not necessary, nowadays, for little girls to sew long seams by hand, for the sewing machine does that work better and more quickly; but every girl should know how to sew, how to crochet, how to knit, how to make

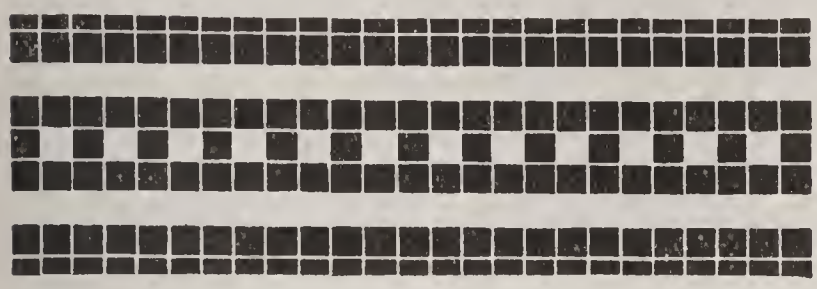


Fig 3

tatting and how to use a number of decorative stitches in embroidery. These arts, which are just as truly arts as painting or drawing, are called *domestic,* because they find their chief uses in our domiciles, or homes. When you hear someone say that a girl is domestic in her tastes, it means that she is fond of her home and of everything that concerns it. Every girl should know a great deal about *domestic art.*

In other countries, such as Sweden, Italy, Germany and Russia, the domestic arts are practiced more than they are in America. The needlework that comes to us from each of these countries has a distinct character and

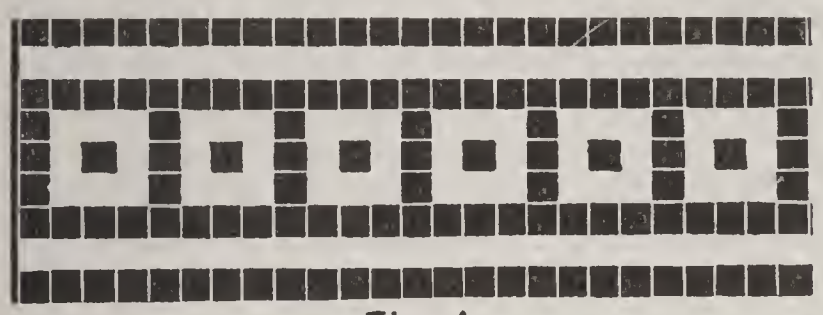


Fig. 4

interest. Swedish weaving, Italian embroideries, Spanish laces and Porto Rican drawnwork are all beautiful examples of the domestic arts of other countries. They are as different from each other as the people themselves are different, and so each country con-

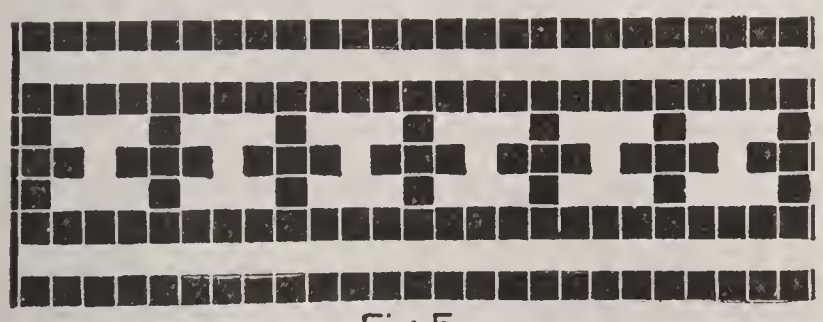


Fig. 5

tributes something to the beautiful work of the world that is distinctly its own.

In America we have not as yet discovered or developed domestic arts that are original. In our crochet-work, for instance, we depend on designs and patterns that have been invented by people in France and Germany, or in other countries. Why cannot the girls of America make their own designs? If they were taught to do so, and if the domestic arts were encouraged, we should surely be able to develop styles that are good, and not copied from other nations.

The girl whose mind and fingers are trained in the various fields of the domestic arts can do much to beautify her home, no matter how humble it may be. By the use of fine needlework, and with her ability to crochet, make tatting, smocking or embroidery, she can add distinction to the most inexpensive

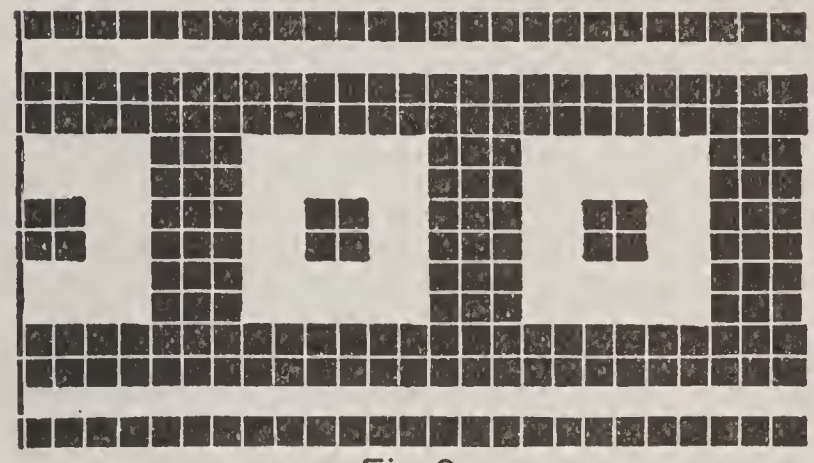


Fig. 6

gown. Knowledge of this kind is worth actual money, for good prices are paid for various forms of hand-work when applied to clothes, to household linens or to fabrics used for decoration about a house. Think of all the different uses we have for borders alone. We use borders on curtains and table runners, on napkins and doilies, on dresses and underclothing, on bags and collars, on towels and pillow cases. All these border designs, whether expressed in lace, embroidery, in crochet or in any other form of needlework, must be invented by somebody. Every girl should be her own designer.

The sketches herewith show one of the simplest ways of beginning the study of design.

Fig. 1 shows a piece of black paper, squared off to represent quarter-inch sections, although in the illustration they are smaller, for convenience. This paper can be bought already prepared, and can be used with white chalk, white crayon, or with a white ink known as *letterine.* In Fig. 2 we see every other square in a certain row filled in with white, which makes the simplest kind of a border. This border is enriched, in Fig. 3, by the addition of marginal bands. The design is now quite complete, and could be worked out in crochet, cross-stitch, or in a variety of simple stitches.

Fig. 4, 5 and 6 show other variations of

this simple way of designing. When you get started at this kind of work, you can hardly keep from making a great number of designs, so interesting is the work and so easy is the process.

However interesting you may find the work on paper, you will enjoy far more working out some of these patterns with actual materials. Fig. 7 was worked in filet crochet. Fig. 8 was worked in a darning stitch, on Russian crash; and Fig. 9 was worked in colored cross stitch on Aida canvas. Any one of these borders may be used in making an article of use and service, for the home. Fig. 12 shows a table runner, made of Russian crash, with the crocheted border used as an insertion. A method of finishing the edge, quite in keeping with the crocheted insertion, is shown in Figs. 10 and 11.

Sometimes we find it easier to design with the materials themselves, rather than to draw designs on paper. There is for sale in the shops a square-meshed open canvas or net, like that represented in Fig. 13. This can be worked in straight-line designs, with single Germantown yarn. The design shown in Fig. 13 is much like the designs in Figs. 4 and 6. It is worked in a simple stitch, with bright orange and black Germantown. Other patterns are shown in Figs. 14 and 15. Borders worked in this style on filet canvas or net can be appliquéd on burlap or any other suitable fabric for a bag. Figs. 16 to 19 show the steps followed in making a shopping bag of brown burlap. A border worked on a strip of filet canvas was button-holed across the bottom of the bag. The color scheme of the border was orange and black. A draw string of twisted orange and black, on which bright orange and blue beads were strung, gave a delightful finish (Fig. 20).

Sometimes the commonest and cheapest fabrics, which show squares, circles or stripes in their patterns, make us think of interesting designs. Figs. 21 to 23 show the possibilities of checked gingham. The color schemes and stitches are given in the appended note. Fig. 25 shows a button bag, made of a piece of ordinary gingham, but the bag looks anything but ordinary because of the unusual design and color it expresses. Satin stitch and couching (Fig. 24) make gingham attractive.

Calicoes and percales are often printed in simple black patterns on white grounds. These patterns may be used as diagrams, upon which we may place a variety of decorative stitches. Fig. 26 shows an ordinary, dotted calico. As a fabric, nothing could be less interesting. But look at the result of a little invention! Fig. 27 shows the steps in working out a simple design, which transforms the uninteresting calico into a bright and attractive trimming, as shown in Fig. 28. The trimming has been used on the cuffs of a little girl's dress as shown in Fig. 29. A variation of the trimming has been used for the girdle and collar.

Other examples of the transformation of cheap and uninteresting fabrics, making them over into real works of art, are shown in Figs. 30 to 32.

Related Subjects. The following articles in these volumes give further information on the subject of domestic art:

Basketry
China Painting
Costume
Dolls, Paper
Embroidery
Home Economics
Industrial Art
Interior Decorations
Stencil

DOMESTIC SCIENCE. See HOME ECONOMICS.

DOMESTIC SERVICE, the name applied to service connected with a household, including the labor of those who work in the house, such as cooks, laundresses, chambermaids, waitresses, butlers, footmen and personal attendants, and of those who do outside work, such as coachmen, chauffeurs and gardeners. Domestic service is one of the unorganized industries; that is, there is no fixed standard of wages or of the number of hours constituting a day's work, and very little has been accomplished in the way of organizing servants' unions. So long as this situation prevails the general condition of the household servant will be more or less unsatisfactory. One of the problems of the present day which is interesting students of sociology is the improvement of domestic service by means of organization, and it is the general belief that putting the entire system on a business basis would benefit both employers and servants. This would make it necessary for the workers to take special training courses, as in the other trades, and it would also give them better standing socially.

Much is heard about the "servant-girl problem." Complaint is made continually, by the women who engage girls to work in the home, of the uncertainty of the whole system, of the lack of a standard of excellence and of a fixed term of service, and of the difficulty of securing competent and reliable workers. The fact that large numbers of untrained immigrant girls take up household work as a means of

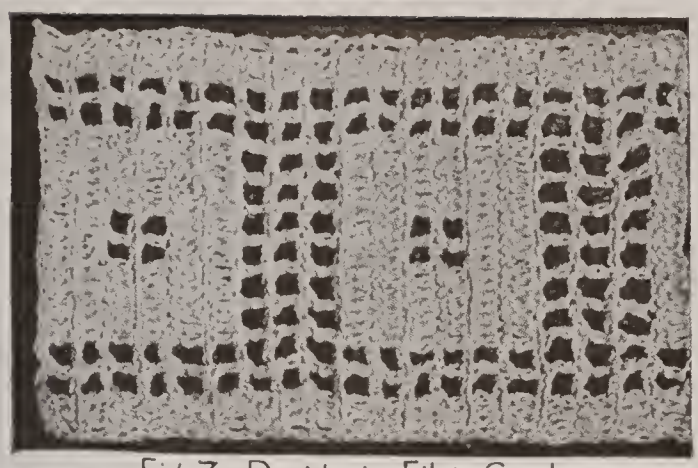


Fig. 7 Design in Filet Crochet

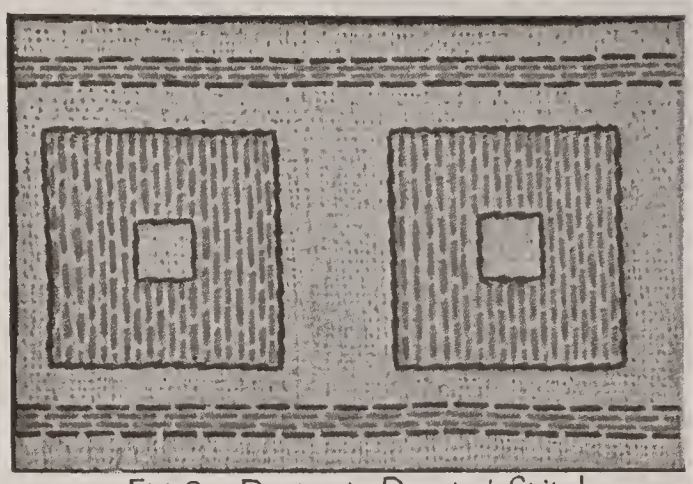


Fig. 8 Design in Darning Stitch

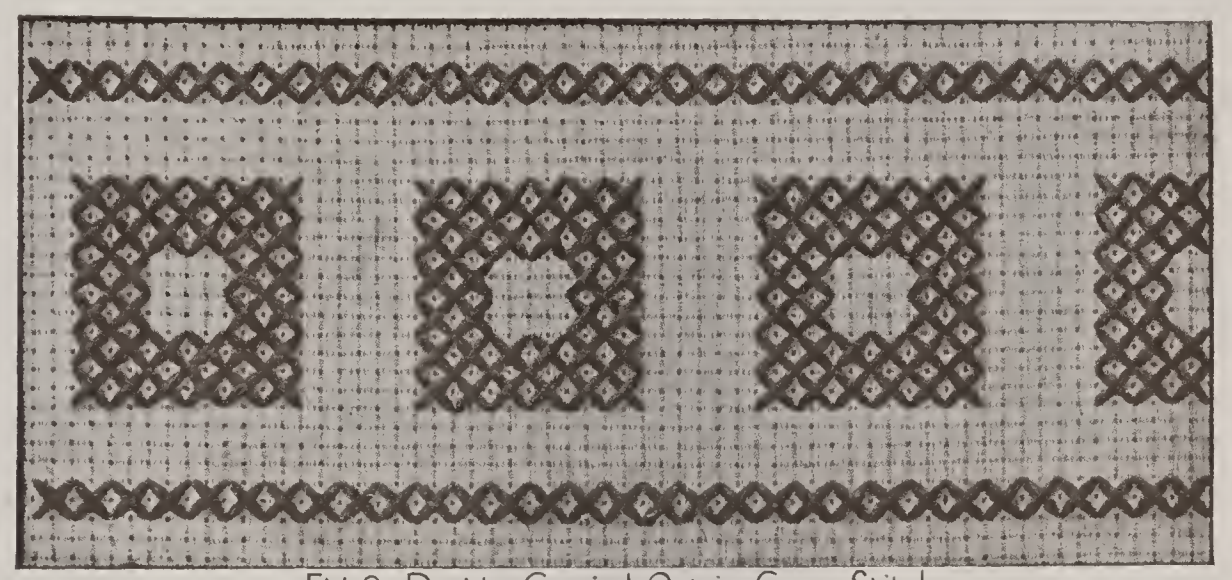


Fig. 9 Design Carried Out in Cross Stitch

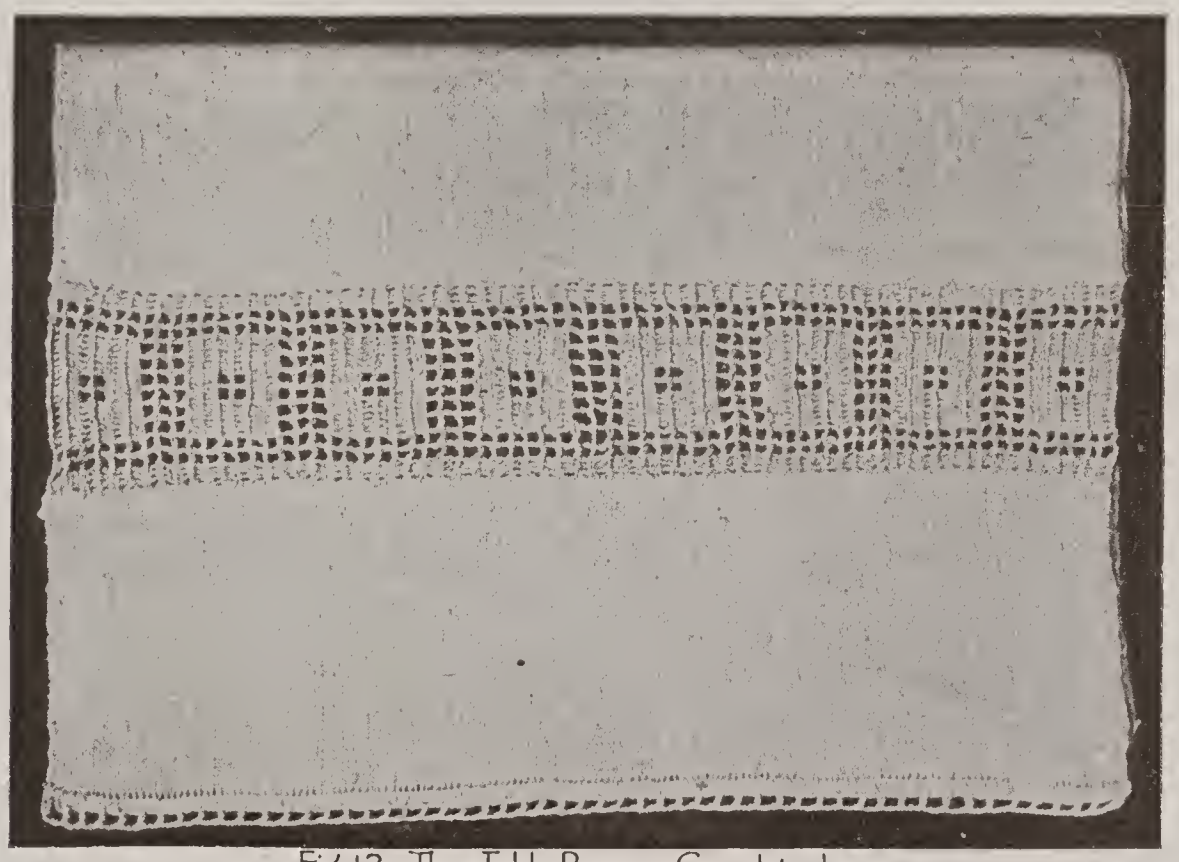


Fig. 12 The Table Runner Completed

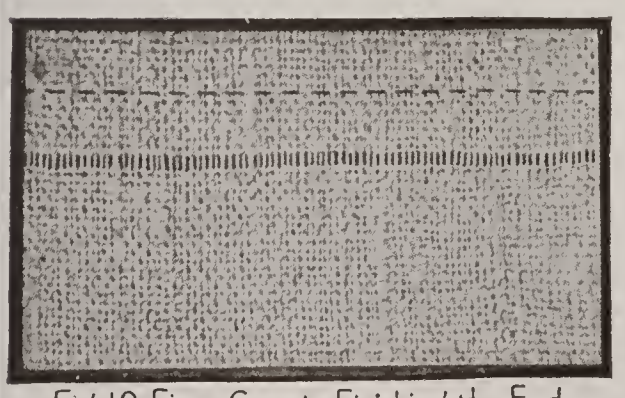


Fig. 10 First Step in Finishing the End

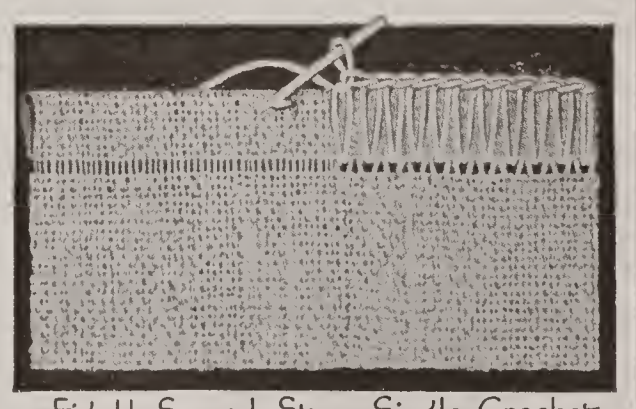


Fig. 11 Second Step · Single Crochet

EXAMPLES OF DOMESTIC ART.

Explanation appears in text-matter.

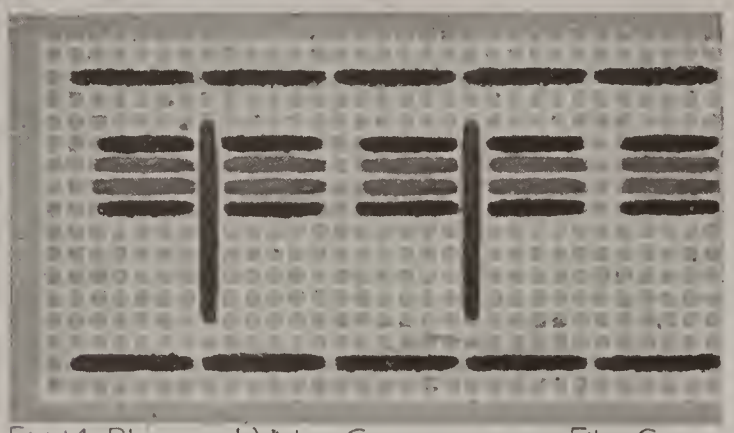


Fig. 14 Black and Violet Germantown on Filet Canvas

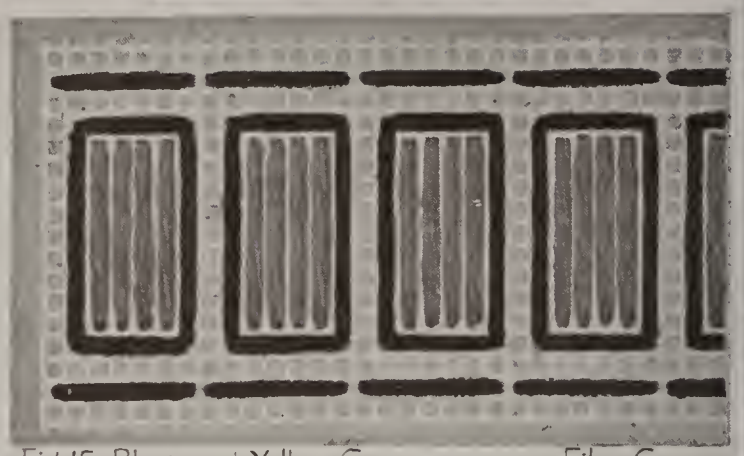


Fig. 15 Black and Yellow Germantown on Filet Canvas

Fig. 18 Canvas Band Buttonholed on Bag

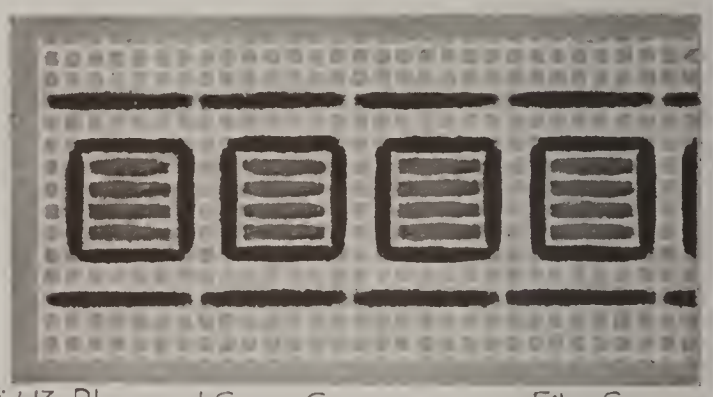


Fig. 13 Black and Green Germantown on Filet Canvas

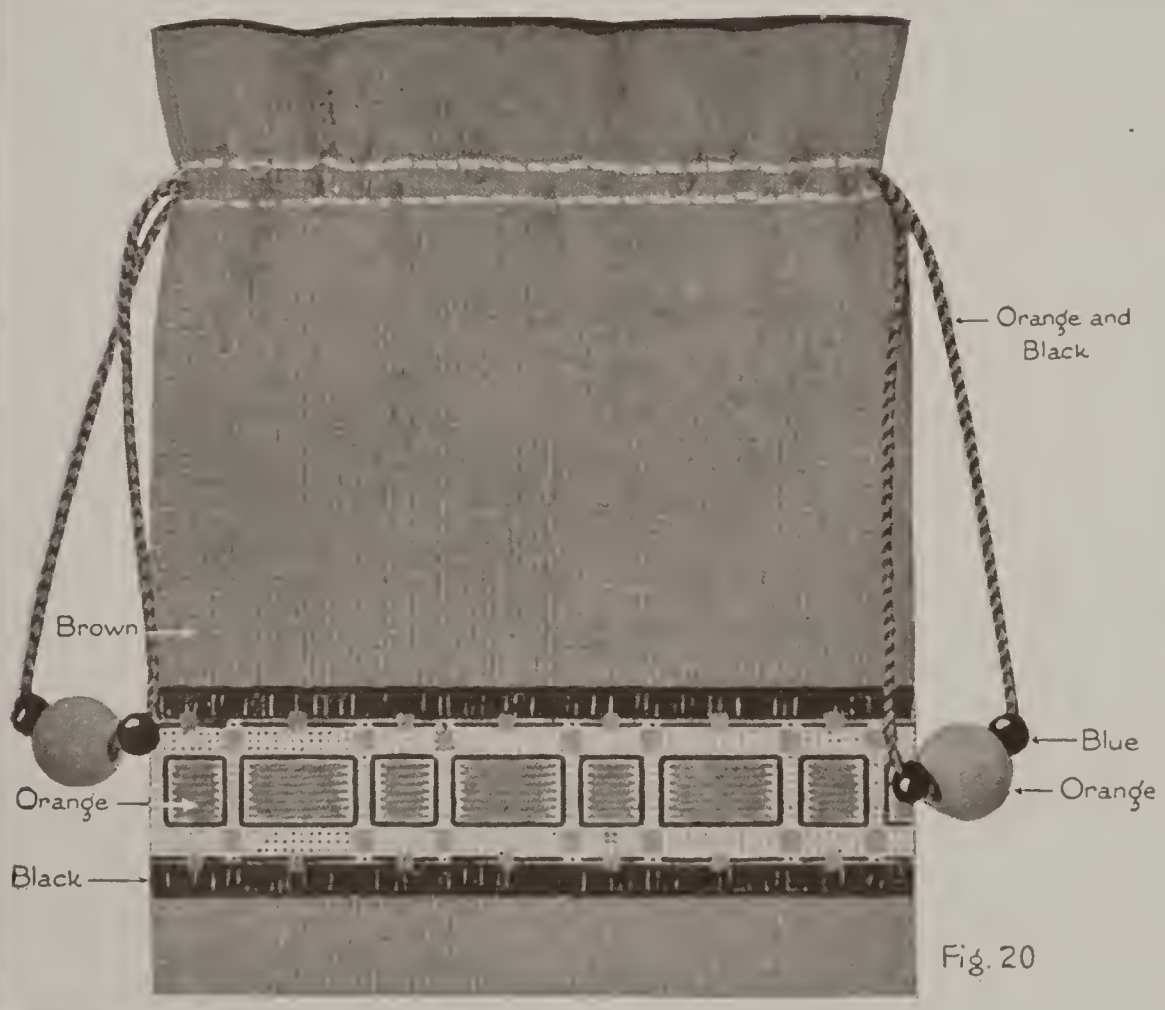


Fig. 20

Fig. 19
Bottom and Side of Bag Sewed in ½" Seams

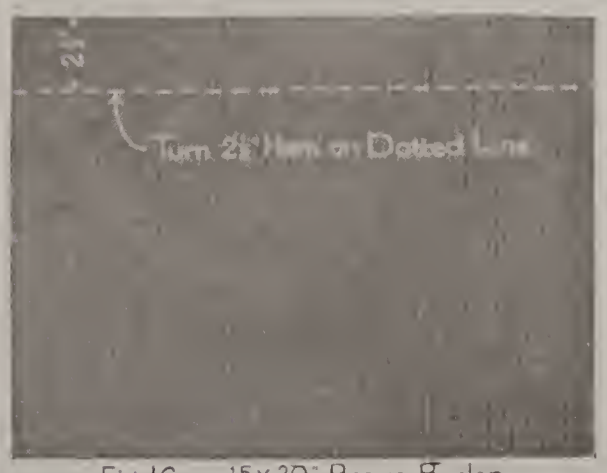


Fig. 16 15 x 20" Brown Burlap

Fig. 17 Hem and Draw String Case Completed

EXAMPLES OF DOMESTIC ART.

Explanation appears in text-matter.

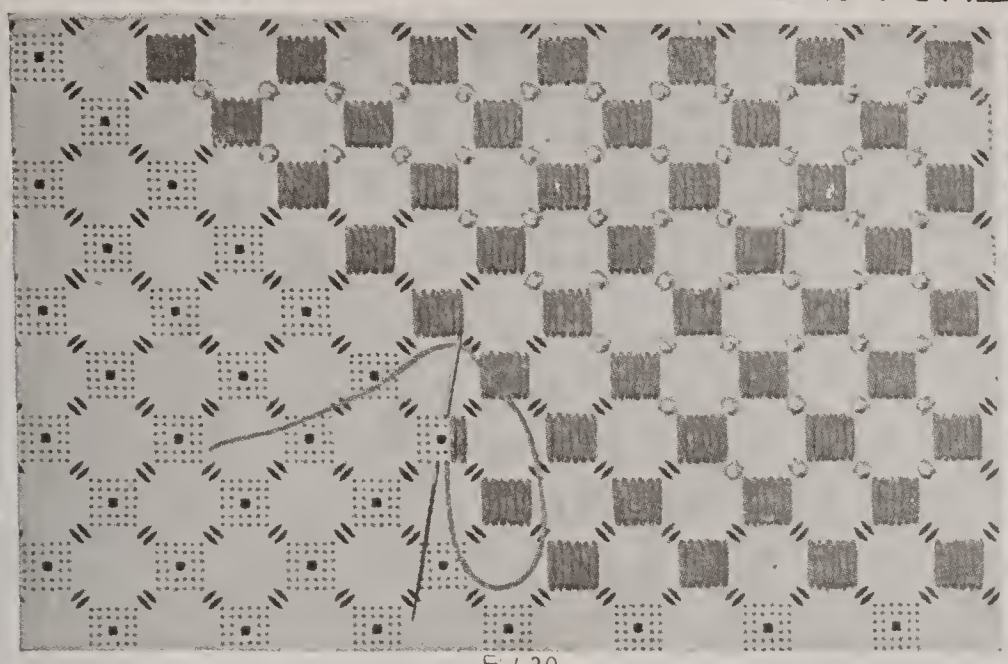


Fig. 30

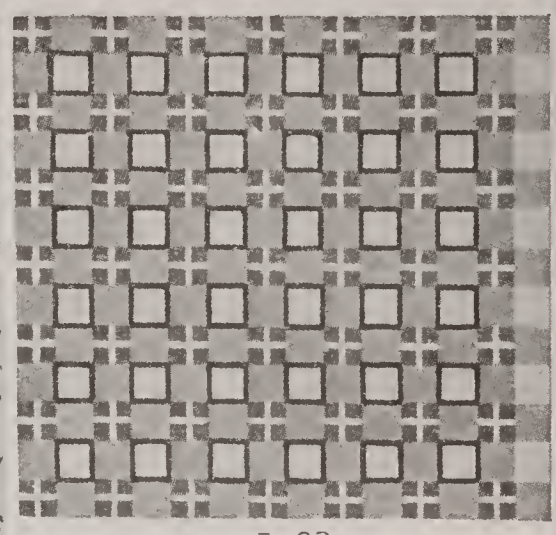


Fig. 23
Violet and White Checked Gingham
Worked with Dark Violet and White Cottons

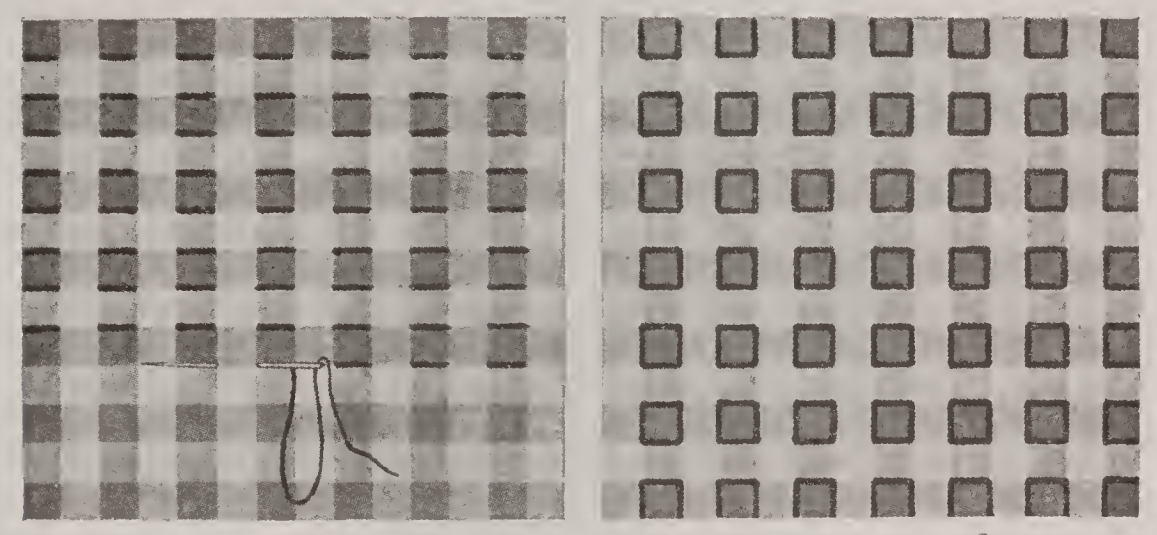


Fig. 22 Blue and White Checked Gingham Worked with Dark Blue Cottons

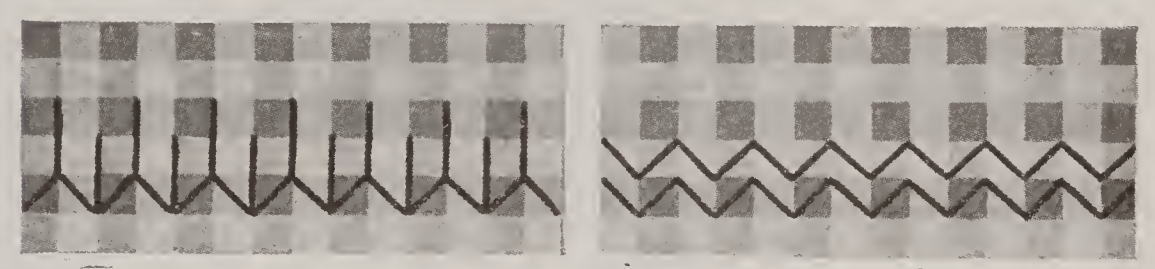


Fig 21 Green and White Checked Gingham Worked with Green and Dark Green Cottons

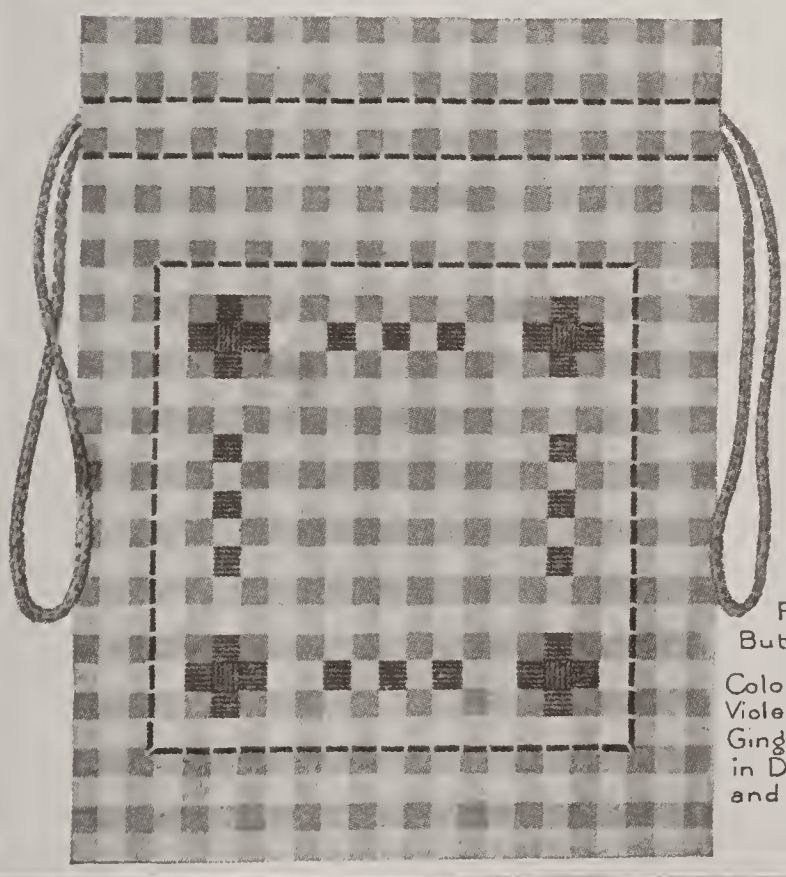


Fig. 25
Button Bag,
Color Scheme,
Violet and White.
Gingham worked
in Dark Violet
and White

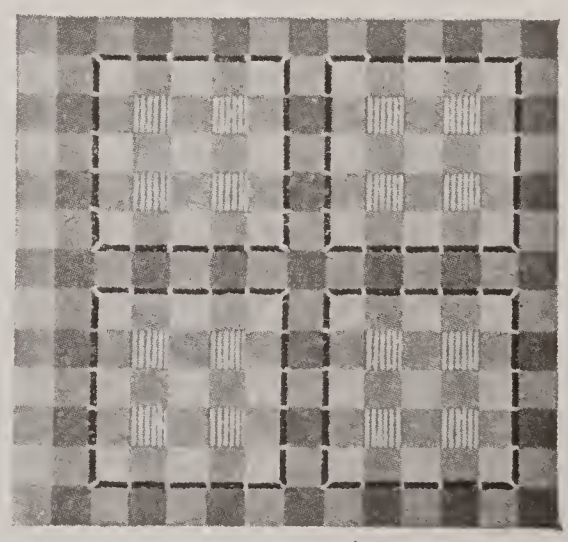


Fig. 24
Satin Stitch and Couching

EXAMPLES OF DOMESTIC ART.

Explanation appears
in text-matter.

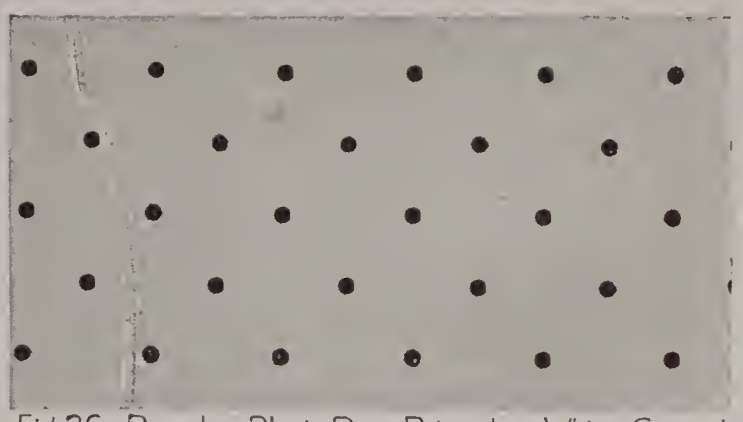


Fig. 26 Percale: Black Dots Printed on White Ground

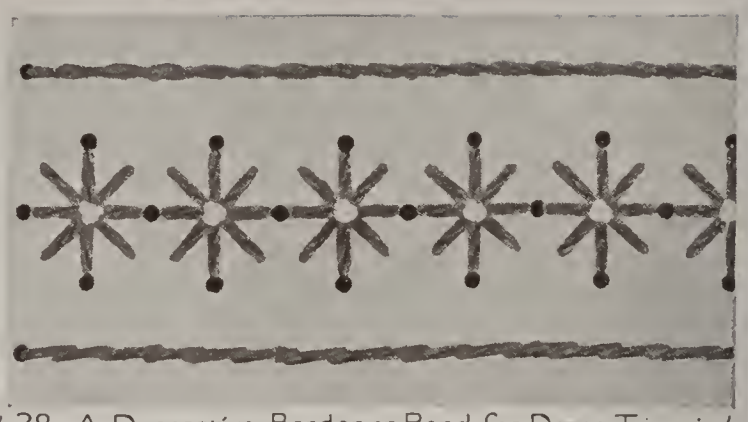
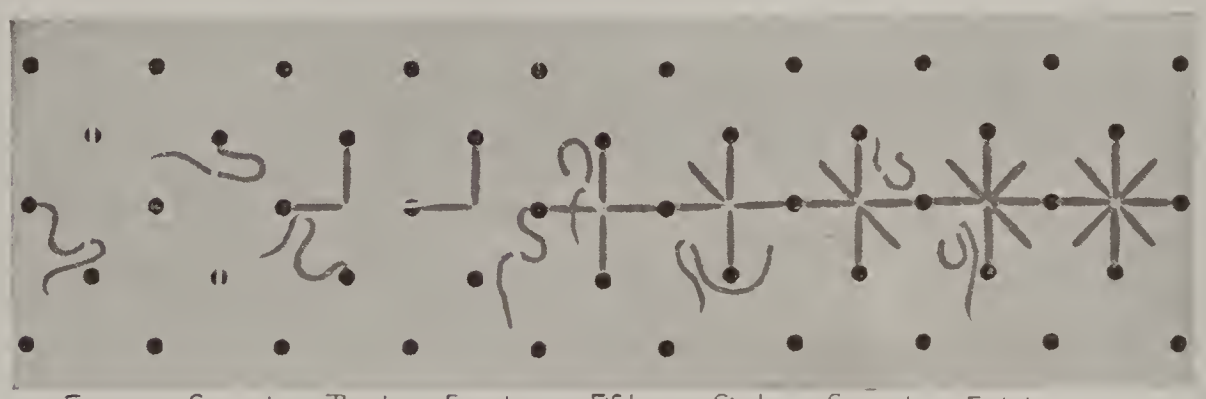


Fig. 28 A Decorative Border or Band for Dress Trimming



First Step | Second Step | Third Step | Fourth Step | Fifth Step | Sixth Step | Seventh Step | Eighth Step

Fig. 27 Stitches Made with Dark Blue Embroidery Floss

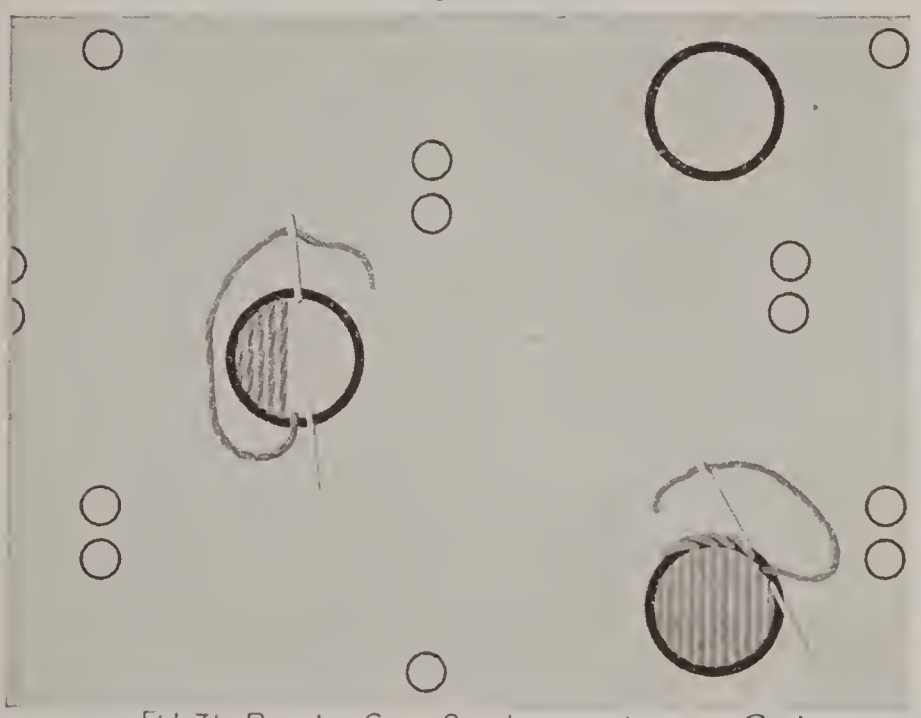


Fig. 31 Percale - Satin Stitch worked across Circle, Outline Stitch around Circle

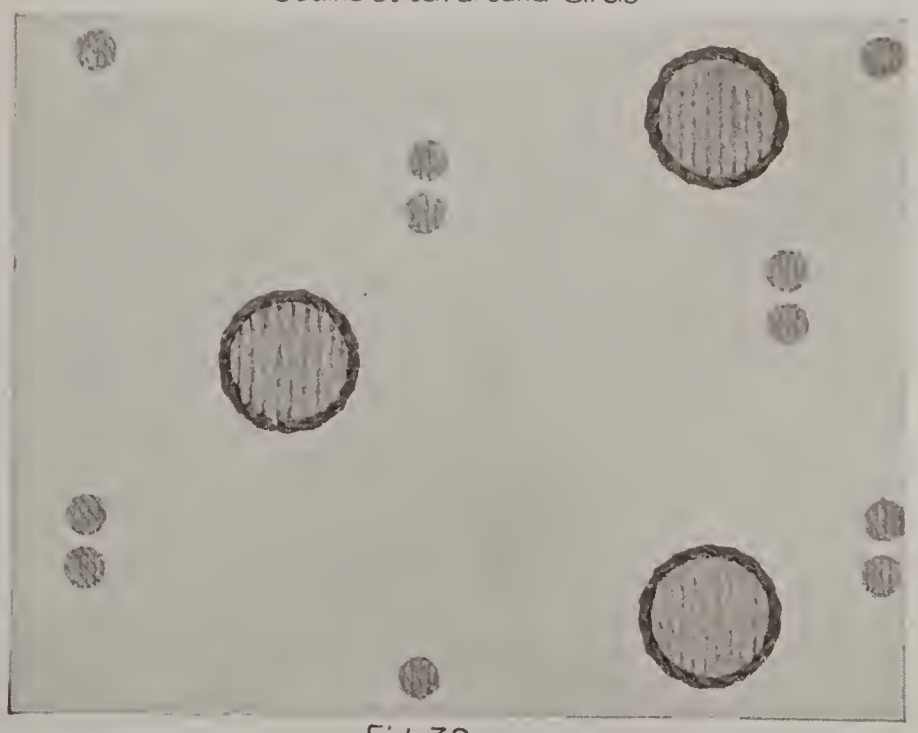


Fig. 32

Fig. 29

EXAMPLES OF DOMESTIC ART.

Explanation appears in text-matter.

earning a living is partly responsible for these conditions. There are numerous domestic science schools, which give excellent courses in the various lines of household work, but these do not usually attract the women who become household servants.

Domestic service would seem to be a solution of the problem of the girl who can earn hardly more than living wages in the department store, factory or office. The domestic helper has a comfortable home, and her living expenses are not paid out of her weekly wage. There are, however, two features of domestic service that bring it into disfavor with the average American or Canadian girl; these are lack of personal freedom and the stigma of social inferiority. The factory or office girl has a certain number of hours between the close of one working day and the beginning of the next that she may call absolutely her own. This is a joy denied the girl who works in the household, and the latter, moreover, must always endure the knowledge that she is put socially beneath her sister who works for an industrial firm.

Interesting remedies for the servant problem are suggested from time to time. A wealthy woman of Chicago has successfully adopted the shift system, whereby groups of servants work for eight hours a day, each group relieving another at a specified time. Such a system, however, can only be practiced in the homes of the rich. Some students of the subject favor the abolition of all individual labor and the establishment of nurseries, kitchens, dining rooms, etc., maintained by several families on the plan of coöperation. Such a system has been successfully tried in Brookline, Mass., but its practicability has not yet been thoroughly tested. Every housewife who engages domestic servants can help to make the profession of housekeeping attractive by providing her maid with a comfortable room and adequate bathing facilities, by allowing her a reasonable amount of time off for recreation, and by treating her considerately and kindly. S.L.A.

DOMINICAN REPUBLIC. See SANTO DOMINGO.

DOMINICANS, *do min'i kanz,* also called PREACHING FRIARS, is the name of a religious Order founded in 1215 by Saint Dominic to extend the power of the Church. Their first house was established in France. Pope Honorius III confirmed the Order in 1216 under the rule of Saint Augustine, with special authority to exercise the powers of priesthood. The Order took definite shape in 1220. Originally a preaching Order, it soon became a power in the great universities of the day; to these it contributed many learned men, among them Thomas Aquinas and Albert the Great. Four Dominicans have occupied the Papal chair, and two were distinguished painters, namely, Fra Angelico and Bartolommeo. An order of nuns was established by Saint Dominic in 1206. It was originally an asylum for women, but later developed into an educational institution. The Dominicans practice extreme austerities, including midnight offices, long fasts, strict discipline, total abstinence from meat, and silence. They are bound by the usual priestly vows of poverty, chastity and obedience.

Saint Dominic (1170-1220), founder of the Order of Dominicans, was born in Spain, and educated in the University of Palencia. After his ordination as a Roman Catholic priest he devoted his life to missionary work and to the relief of the poor. In 1215 he went to Rome and spent his remaining years in the organization of the Order of Dominicans. He is said to have arranged the form of prayer known as the *Rosary.* G.W.M.

DOMINION, *do min'yun,* a town in Cape Breton County, Nova Scotia, on Cape Breton Island, twelve miles northeast of Sydney, five miles north from Glace Bay and twenty-seven miles north of Louisburg. It is thirteen miles from the Sydney & Louisburg Railway, with which it is connected by electric tramway. The town is named for the Dominion Coal Company, whose mines in or near the town have an annual output worth $1,000,000 and furnish employment to 2,000 people. Dominion was settled in 1884, and was incorporated as a town in 1906. Population in 1911, 2,589; in 1921, 2,390 F.J.M.

DOMINION DAY, a national holiday in Canada, to celebrate the confederation of the provinces under one government. In accordance with the British North America Act, the Dominion came into existence on July 1, 1867, and each year the anniversary of this day is celebrated as a holiday throughout the Dominion. It is perhaps the most important holiday of the year. The Union Jack flies from every public building and schoolhouse and from many private homes. Patriotic programs are given in public halls or on village greens, and athletic meets are held and ball games played. The day, in short, expresses the patriotism of the nation, but it is also a day of relaxation and recreation. In the United

States the holiday which corresponds most closely to it in spirit and observance is Independence Day, the Fourth of July. See BRITISH NORTH AMERICA ACT.

DOMINOES, *dom'inoze.* Few indoor games which children play have more fascination for them than dominoes, in which small, rectangular pieces of wood or ivory, plain on one side and divided by a line into two parts on the other side, are used. The blocks are generally black and thus the name *domino,* which is the name of a black mask, was given to the small blocks from which the game gets its name. There are twenty-eight dominoes in a regular set, and these are marked with dots on the side where the line divides the piece into two parts. One of these dominoes is blank on both sides of the dividing line, while the rest are numbered downward through all combinations from double six to double naught.

In playing the game, the dominoes are placed face downward and after mixing them well each player is allowed to choose a certain number, usually five; the first player is the one who has the highest double among his five dominoes. Suppose it is the 4-4. Then the next player must play so that one end will match this domino, for instance a 4-5. The following player must match by playing the 4 or 5. Thus the game goes on, and if one cannot play he draws from the pile left until he gets one which will match. After the pile is all used a player must "pass" if he cannot match—that is, he must miss his turn. The one who first plays off all his dominoes wins, or if the game is blocked, the one who has the lowest number of dots wins. Many special ways for making the game more difficult have been added to the original game, and these are called by different names, such as *muggins, all fives* and *block game.*

This game is valuable as well as interesting to young children, for it teaches them addition, and tends to make them watchful and alert; older children learn much in the power of concentration and planning, as it is a game of skill as well as chance. E.C.

DOMITIAN, *do mish'ian* (51-96), a cruel Roman emperor, whose persecution of Christians and murder of men of talent, learning and wealth finally led to his assassination. During the first part of his fifteen years as ruler many good laws were passed, but his ambition and jealousy soon over-balanced his judgment. After the tyrant had been assassinated with the aid of his wife, the Senate ordered his name erased from all public monuments and books. In the reign of Domitian the Roman general Agricola extended the boundaries of the empire into the interior of Scotland and built a line of forts from the Firth of Forth to the Firth of Clyde.

DON, *dahn,* an important river in Russia, flowing southward from a small lake in the government of Tula. After a course of 1,150 miles it empties into the Sea of Azov. It is navigable for 800 miles from the sea and is important as a commercial route. In its upper course it flows through low-lying, swampy land, but for the greater part it runs through rich agricultural and timber districts. At one point it approaches within thirty-seven miles of the mighty Volga River, with which it is connected by a canal. The waters of the Don carry a great volume of internal products, especially lumber, grain and cattle. It abounds in fish, and the fisheries give employment to thousands of men and women. Its chief tributaries are the Donetz, Sosna, Voronezh, Manytch and Medvieditza. At its mouth is the port of Azov, growing steadily in importance as the river traffic increases.

DONATELLO, *don ah tel'o* (1386-1466), an Italian artist, the founder of modern sculpture. He was the son of a wool merchant, but was early adopted by wealthy relatives, and in their home learned to love things beautiful and artistic. He worked at the goldsmith's trade, and when Brunelleschi, the great architect, was attracted to the boy and took him to Rome, Donatello was at once able to support himself by his skill in working metals. After several years of study of statuary in Rome, Donatello returned to Florence, the home of his childhood, where he made many statues for the cathedral and campanile, besides doing much work for important patrons. His two statues of *Saint Peter* and *Saint Mark* were greatly admired, but when he produced *Saint George,* the man in armor, it was considered his masterpiece. Michelangelo, when he saw it over a hundred years later, stood before it a few moments and then said, "March!" The statue was so real and full of life that it seemed a soldier ready to obey orders.

In 1433 Donatello went again to Rome. His work from that time shows the influence of classic art, but he added to it his own genius, which put motion and grace into his figures. Until his day men had carved their statues as part of the buildings in which they stood. In 1434, when Donatello returned once more

to Florence, he showed how wonderfully a frieze could be made a part of a cathedral, and yet have life in it, when he made the *Singing Gallery*. His equestrian statue, the first of modern sculpture, which he made in 1446, ranks as his best work, but in it he did not quite get away from old traditions, for he had a ball for the horse to rest his foot upon. After traveling widely, Donatello settled in Florence in 1457 with his mother and sister, where he lived simply, unspoiled by praise and success. He was the greatest sculptor of the Italian Renaissance and prepared the way for Michelangelo (which see). E.C.

DONIZETTI, *doh ne dzet' te,* GAETANO (1797-1848), an Italian operatic composer, most widely known through the famous melodious sextette from his opera *Lucia di Lammermoor*. Both that opera and *Lucrezia Borgia* have been called by various admirers his masterpiece. He showed remarkable skill in writing for the voice, but produced his operas so rapidly, writing sixty-four in all, besides other compositions, that, though many are brilliant and effective, all would have been better if they had been given careful revision. Among his operas are *Les Martyrs, La Favorita, Anna Bolena,* the comic opera *Don Pasquale* and the light, sparkling operetta *La Fille du Regiment* (Daughter of the Regiment), all of which have enjoyed great popularity.

DON JUAN, *don hwahn,* a legendary hero of Spain, whose life story has been made the basis for many dramatic and poetic forms. Molière, Corneille, Milton, Mozart, Byron, Dumas, Balzac and Flaubert are among the great poets, writers and musicians who have made this romantic character the subject of their works.

There seems to have been a certain historical foundation for him in the life of a member of the noble family of Tenorio, at Seville. According to the legend, Don Juan cared only for self, and acknowledged no higher obligation than his own will imposed. Failing in his attempt to abduct the daughter of the governor of Seville, he was challenged by her father, whom he killed in a duel. To demonstrate his belief that spirits do not exist, he visited the tomb of the murdered man, ordered a feast to be prepared there and invited the statue to follow him to a revel. To his horror, the "stone figure" accepted the invitation, appeared at table among the guests, promptly compelled Don Juan to follow him and at once delivered the blasphemer over to perdition.

Mozart's famous opera, *Don Giovanni,* made the story popular all over Europe. Byron's *Don Juan* follows the name, and to some extent the character, of the original legend of this ne'er-do-well. In some of the later dramatic versions, other features are introduced attributed to another personage named Don Juan of Maraña, who, through his mother's influence in having masses said for his salvation, ended his days in a monastery where he subjected himself to the severest penance, to atone for a life of debauchery and crime.

DONNELLY, *don' el i,* IGNATIUS (1831-1901), an American prose writer and journalist, who tried to prove that Bacon wrote the works of Shakespeare. He was born in Philadelphia, educated in the public schools, studied law, and was admitted to the bar in 1852. In 1859, after his removal to Saint Paul, Minn., he was elected lieutenant-governor and served as a congressman from that state from 1863 to 1869. He then left the Republican party to become associated with the People's party, receiving nomination from the latter for the Vice-Presidency in 1898. From 1873 to 1878 he was editor of the *Anti-Monopolist* at Saint Louis, and in his later years edited *The Representative* in Minneapolis. His best-known works include *Atlantis, the Antediluvian World, Ragnarok,* and *The Great Cryptogram.* In the latter he attempted to prove the theory of the Baconian authorship of Shakespeare's plays, based on a cipher which he claimed to have personally discovered. His contentions failed deeply to interest the literary world.

DON QUIXOTE (Spanish, *ke ho' ta*), the title of a masterpiece of burlesque in literature, written by Cervantes, which has entertained people of all nations and all times since its publication in two parts, in 1605 and 1615. It is also the name of the hero of the story, the "Knight of the Rueful Countenance."

This book was written to ridicule absurd stories of chivalry which were so popular in the time of Cervantes. Throughout the tale, with its wealth of comedy and its faithful picture of every class of society of the sixteenth century, runs a strain of sadness and keen human understanding. The brave, courteous old gentleman, Don Quixote, his brain filled with the deeds of knights as pictured in books he has read, ventures forth to seek adventure of his own in a world where knight-errantry is no longer known. With him, as squire, goes the simple, faithful Sancho Panza, and together they pass through dangers and many comical episodes,

until Don Quixote falls ill. His belief in knight errantry is shattered, and he dies expressing aversion to books of chivalry.

From *Don Quixote* have come many sayings of popular usage, such as "Murder will out" and "A bird in the hand is worth two in the bush." There has been much discussion as to the proper way for Americans to pronounce "Don Quixote." The Spanish pronunciation is usually heard among educated people, although so eminent a man as James Russell Lowell advocated the simplest English pronunciation—*Don Kwixote*—just as the letters suggest the sounds. See CERVANTES SAAVEDRA, MIGUEL DE.

DOOM, DOUM or **DUM PALM,** a palm of Upper Egypt and Central Africa, remarkable for having a many-branched stem. It grows both in dense forests and singly in desert sands. Each branch of the doom palm ends in a tuft of deeply-lobed fan-shaped leaves. It bears an irregularly-oval fruit about the size of an apple, with a red outer skin covering a thick, spongy and rather sweet substance which tastes like gingerbread; the palm has often been called the *gingerbread tree.* This pulp furnishes food to the poorer inhabitants of the countries where such trees grow, and an infusion made from it is found cooling and effective in cases of fever. Within each fruit is a horny, semi-transparent seed, which is used as a bead for ornamentation. Ropes are made from the leaf-stalk fibers. See PALM.

DORÉ, *doh ra',* PAUL GUSTAVE (1833-1883), a French painter and sculptor, but preëminently the illustrator of a series of literary masterpieces with which his name will forever be associated. Among them are the Bible, the works of Rabelais, Sue's *The Wandering Jew,* Dante's *Divine Comedy,* Lafontaine's *Fables,* Tennyson's *Idylls of the King,* Coleridge's *Ancient Mariner* and Poe's *Raven.*

He was born at Strassburg and at an early age gave promise of ability; in fact, his fame as an illustrator came so early in life and the demand for his art was so great that he was given but little opportunity for technical training and study. He himself admitted that between 1850 and 1870 he earned £280,000, or $1,400,000, by his pencil. For many years there was a Doré gallery in London, filled with his works, which were more popular there than in France. Among the paintings there were the enormous canvases of *Christ Leaving the Praetorium* and *Christ's Entry into Jerusalem.*

However, he is seen at his best in his book illustrations, interesting especially because of the imaginative power and dramatic sentiment he was able to weave into them. Subjects of a weirdly-humorous character appealed to him most strongly. Doré's popularity extended throughout the United States and Canada, as well as Europe. In addition to his illustrations he did a number of historical paintings in oil and water colors, and had considerable success as a sculptor.

DORIANS, *do'rianz,* the most conservative and practical of the four great branches of the ancient Greek race; the others being known as Achaeans, Ionians and Aeolians. Long before the period of known history began the Dorians were driven by invaders from their home in Thessaly, on the eastern slopes of the Pindus range, and, moving southward through Central Greece, settled finally in the Peloponnesus. Their most important representatives in historic times were the Spartans (see SPARTA). According to tradition, the Dorians took their name from Dorus, the son of Hellen, who was the legendary ancestor of the Greek race.

DO'RION (in French, *do re oN'*), SIR ANTOINE AIMÉ (1818-1891), a Canadian jurist and statesman, one of the political leaders in the period preceding Confederation, the spokesman of the *Partie Rouge,* or "red party," the radical wing of the French-Canadian Liberals. Later in life he served with distinction for many years as chief justice of the province of Quebec. Dorion was born in the parish of Saint Anne de la Pérade, in Champlain County, Quebec, attended Nicolet College, studied law at Montreal and was called to the bar in 1842. He entered public life in 1854 as a member of the Canadian assembly, in which he sat, except for one interval of several months, until Confederation in 1867. Dorion soon became a leader of the reformers who sought to secure representation by population, or "rep. by pop.," as it was called. In 1856 he suggested a federal union of Upper and Lower Canada, but did not continue to advocate this plan.

On August 2, 1858, he accepted the position of commissioner of Crown lands for Lower Canada in the government headed by George Brown, known generally as the Brown-Dorion Ministry. After holding office for only four days the Ministry resigned, after the assembly had voted a lack of confidence. This was the shortest Ministry in Canadian history. Dorion continued to sit in the assembly, and between 1862 and 1867 was in turn commissioner of Crown lands, provincial secretary and attorney-general for Lower Canada. At the first general

election after the organization of the Dominion he was elected to the House of Commons, and in 1873 was appointed Minister of Justice in the Mackenzie government, but he resigned in the next year to become chief justice of the province of Quebec, an office which he held until 1887.

DORMOUSE, *dawr'mous,* a small, squirrel-like rodent which passes most of its life sleeping; that is, it remains much of the time in a dormant state, hence the name. Various species are common in temperate and warm parts of

A DORMOUSE
About actual size.

Great Britain, Europe, Asia and Africa, but none is known in America, although the common white-footed mouse is sometimes called a dormouse.

The general characteristics of all species are long, squirrel-like tails, two or four pairs of cheek teeth, large heads with rather pointed muzzles, large, prominent eyes and mouselike ears. They are beautiful animals, with hair fine and silky. Like squirrels, they sit up on their hind legs, holding their food of acorns, hazelnuts or grain between their forepaws; but unlike the squirrels, they go about at night. All winter they sleep curled into a little ball in their neat nests in bushes, awakening only occasionally on a warm, sunny day to eat from their hoarded store of food.

DORR'S REBELLION, a disturbed condition in the state of Rhode Island from the autumn of 1840 until May, 1842, caused by Thomas Wilson Dorr in the interest of suffrage. After the Revolutionary War Rhode Island was still governed under its charter of 1663, whereby the right to vote was restricted to holders of $134 worth of real estate or land bringing an annual rental of $7, and to their eldest sons.

Dorr voiced the discontent of the people and headed a party for the extension of suffrage to all males of legal age. They held a convention and drafted a constitution; at the same time, the state government, realizing the revolutionary state of affairs, called a legal convention which drafted an equally-liberal constitution. Both were submitted to the people; Dorr's reform document received the majority of votes, but it was declared illegally adopted. By election of the suffragists, Dorr was made governor, and Samuel W. King was elected governor at the regular elections. Dorr and his followers stubbornly attempted to sustain their government by force of arms, but through the aid of United States troops the rebellion was quelled. Dorr was convicted of treason and sentenced to imprisonment for life, but was afterwards pardoned.

Thomas Wilson Dorr (1805-1854) was a member of the Rhode Island legislature in 1833-1837. He was born at Providence, R. I., and was educated at Harvard College. Had it not been for Dorr's agitation, suffrage might not have been extended in Rhode Island for many years.

DORTMUND, *dawrt'moont,* an important mining city in the fertile German province of Westphalia. It is situated near the River Ems, seventy-three miles northeast of Cologne. Although an ancient city, established before the year 900, its growth has been very rapid only during recent years, owing to railway development and the opening up of mines and industries. The iron industry is of great importance, and there are very large plants, some employing as many as 26,000 men. Locomotives, cars and all kinds of heavy machinery are manufactured, and there are numerous breweries, potteries and chemical works. Dortmund was a flourishing member of the Hanseatic League (which see), but steadily declined from the fifteenth century until after the Franco-German War (1870-1871). It then received an impetus which caused it to develop almost as rapidly as any of the western towns of the United States and Canada. Population in October, 1919, 295,026.

DOUAY, *doo a',* or **DOUAI BIBLE,** the name commonly applied to the translation of

the Vulgate, or Roman version of the Bible, which had been declared by the Council of Trent to be authoritative for English-speaking Catholics. The original Douai edition is the foundation on which practically all the English Catholic versions are based. The New Testament was published at Rheims in 1582, and the Old Testament at Douai in 1609. The work of translating was done by a number of Romanist refugees connected with the seminary and college of Douai and Rheims, under the leadership of Dr. Gregory Martin, a distinguished Greek and Hebrew scholar. Numerous later revisions were made, chiefly to correct the literary style, words of Latin origin having been originally used instead of their simpler English equivalents. The best-known Roman Catholic Bible published in England in modern times is perhaps Haycock's, first issued at Manchester in 1811-1812. In America a revision of the Douay version by Archbishop Kenrick (1849-1850) is much used.

DOUBLE STARS. If you look sharply at Mizar, the star next to the end in the handle of the Big Dipper, you will observe that nestling close to it is a tiny companion called Alcor. Seen through a telescope Mizar would appear to you as a pair of large stars, one white and one green, and with the spectroscope astronomers have discovered that one member of this pair is in fact composed of two stars. Mizar is thus an example of two kinds of double stars. The two parts into which the telescope separates it are really independent of each other, but as we look out upon them from the earth one is almost directly behind the other, and the rays from them find the same spot in the retina of our eye. Alcor and Mizar are called *optical doubles,* because to our unaided eyes they appear companions; similarly, the two parts of Mizar form a *telescopic double.* But the star which the spectroscope separates into two is entirely different. It is called a *physical double,* or *binary system,* because its members revolve about a common point, the center of gravity of their combined masses. Thousands of binary systems are known; more about them will be found in the article ASTRONOMY. See, also, SPECTROSCOPE.

DOUGHERTY, DENNIS J., an American cardinal of the Roman Catholic Church. Early in his priestly career he connected with Saint Charles Seminary, Overbrook, Pa., then for twelve years thereafter his activities centered in the Philippine Islands, first by appointment as bishop of Neuva Segovia in 1903. In 1915 he returned to the United States and was appointed bishop of Buffalo (N. Y.). Three years later he was raised to the dignity of archbishop and appointed to the see of Philadelphia and province of Pennsylvania. In 1921, after the death of Cardinal John M. Farley, he succeeded to that high post.

DOUGHTY, *do'ti,* ARTHUR GEORGE (1860-), a Canadian historian, Dominion archivist and keeper of the records since 1904. Dr. Doughty was born at Maidenhead, Berkshire, England, and was educated at Eldon School, London, and at Oxford University. He moved to Canada in 1886 and held several commercial and secretarial positions before his appointment to succeed Douglas Brymner as Dominion archivist. Dr. Doughty was one of the first to realize the necessity of collecting documentary material of Canadian history.

DOUGLAS, *dug'las,* ARIZ., known locally as the *Smelter City,* is a substantially-built town in Cochise County, in the southeastern corner of the state. It is 217 miles west of El Paso, 650 miles southeast of Los Angeles, and 1,098 miles southwest of Kansas City. It is on the El Paso & Southwestern Railroad, whose western terminus is Tucson, 124 miles west, where it connects with the Southern Pacific. The Nacozari Railroad extends south from Douglas to Nacozari, Mex., an American mining town. The population of Douglas in 1920 was 9,916.

Douglas probably ships more range stock raised in both Arizona and Mexico than any other border town, and is the market for hundreds of small towns below the border which are supported by mining and cattle raising. West of the city are two large smelters, which receive ore from the rich mines of Bisbee and from the Mexican districts of Nacozari, Arispe, Moctezuma, El Tigre and Pilares. The mineral products are copper, gold, silver, lead and zinc.

In the army maneuvers which followed the Mexican bandit raid on Columbus, N. Mex., in March, 1916, Douglas was an important post. Details of this period of border history are given in the articles MEXICO and UNITED STATES, subtitles *History.* O.K.G.

DOUGLAS, SIR JAMES (1803-1877), a British colonial administrator, regarded as the founder of British Columbia. He was born in British Guiana and spent his boyhood in Scotland, but at the age of sixteen moved to Canada, where he entered the employ of the Northwest Company. When this company was absorbed by the Hudson's Bay Company in 1821, Douglas was sent into the territory west of the Rocky

Mountains. After holding a number of positions under John McLoughlin (1784-1857), he was in 1830 appointed McLoughlin's chief assistant at Fort Vancouver, and finally succeeded him as chief factor. In 1851 Douglas became governor of Vancouver Island, then under the control of the Hudson's Bay Company, and later he also became governor of the Crown colony on the mainland, which was first called New Caledonia and later British Columbia.

Until 1864, when he retired from public life, he was not merely the chief representative of the company, but was also, after the colonies were transferred to the Crown, the royal governor. There is no question that he was an autocrat in office. He observed certain forms of government, and in 1856 even allowed the establishment of representative government in Vancouver Island, but it was the will of Douglas that ruled. The rapid increase in population which followed the discovery of gold on the Fraser River led to demands for a more democratic form of government, with which Douglas had no sympathy. He finally resigned his office because he felt that he could not change his views, yet his bitterest opponents paid tribute to his honesty, courage and ability, and admit that the stimulus which he gave to the colonies justifies his title, the "founder of British Columbia." G.H.L.

DOUGLAS, Stephen Arnold (1813-1861), an eminent American statesman whose skill as a debater and resourcefulness as a political leader made him one of the most prominent figures during the stormy period before the War of Secession. Small of stature, but with large head and massive shoulders, he was popularly known in his day as "The Little Giant," giving "the image of power under close compression." In American history his name is especially associated with the doctrine of "squatter sovereignty," of which he was the most distinguished champion (see Squatter Sovereignty).

STEPHEN A. DOUGLAS

Douglas was born at Brandon, Vt., and spent the first fifteen years of his life on a farm. A meager country schooling, a year or so of academy training and a course in law constituted his preparation for his public career. Admitted to the bar at Jacksonville, Ill., in 1834, he soon gained a large practice, and having associated himself with the Andrew Jackson Democrats was elected in 1835 to the office of prosecuting attorney for his district. The following year he was sent to the lower house of the state legislature; from 1841 to 1843 he was judge of the supreme court of Illinois, and in 1843 he entered the national House of Representatives. In 1847 he began his first term in the United States Senate, where he was conspicuously before the public until his death.

Soon after his appearance in Congress, Douglas was singled out as one of the most energetic and able of the Democratic leaders. His enthusiasm for the Westward expansion of his country made him a champion of the annexation of Texas and advocate of the Mexican War, and, as he was chosen chairman of the Senate committee on territories, it was his task to introduce bills for organizing the territories of Minnesota, Oregon, New Mexico, Utah, Washington, Kansas and Nebraska. He was soon in the very storm center of the slavery controversy, for the question of admitting the territories as free or slave became the great issue of the hour. In 1854 he reported the famous Kansas-Nebraska Bill (which see), giving to the people of those territories the right of deciding whether or not slavery should be permitted within their boundaries, and therefore bringing the squatter sovereignty principle squarely before the people. The passage of this bill was due to Douglas' brilliant qualities of leadership.

In 1858 he toured the state of Illinois in a stirring campaign for reëlection to the Senate, having for his Republican opponent a man as yet unknown to fame—Abraham Lincoln. In a series of debates that attracted wide interest, the two discussed the whole problem of slavery and its extension. Douglas was playing for two prizes, the Senatorship and the Presidency, a fact which Lincoln knew when he put to his opponent the question—"Can the people of a territory, against the wish of any citizen of the United States, lawfully exclude slavery from its limits before the formation of a state constitution?" Douglas answered "Yes," which pleased his constituents and secured his reëlection to the Senate, but which lost him the support of the Southern Democrats and doubtless the Presidency of the United States. In 1860 he was nominated for the Presidency by

the Northern Democrats, but was repudiated by the South, and in the election won only twelve electoral votes. His popular vote, however, was second to Lincoln's.

From a personal standpoint Douglas was not opposed to slavery, but no one was more loyal than he in upholding the integrity of the Union, and, on the outbreak of the War of Secession, in accordance with Lincoln's request, he began a tour of the border states to arouse enthusiasm for the cause of the North. Two months after the fall of Fort Sumter he died. His grave, in a small park of Chicago, at the foot of Thirty-sixth Street, on the shores of Lake Michigan, is marked by an imposing monument and statue.

Consult Carr's *Stephen A. Douglas;* Brown's *Stephen A. Douglas* in "Riverside Biographical Series."

DOUGLASS, FREDERICK (1817-1895), an American lecturer and journalist, of negro descent, who, even with the great handicap of color, achieved success and honor after his release from slavery. He was born at Tuckahoe, Md., of a white father and a negro mother, whose servitude he shared, according to the law of the time. When he was ten years old he was put to work in a Baltimore shipyard, where he taught himself to read and write. At the age of twenty-one he made his escape from slavery by disguising himself as a sailor. After working for several years as a day laborer in New Bedford, Mass., he brought himself to the attention of the Massachusetts Anti-Slavery Society by a speech made before a convention at Nantucket, and was soon sent out as a lecturer under the auspices of the society. His work took him to England, where money was raised to buy his freedom.

Douglass published an abolition paper for several years before the War of Secession, and in 1870 started *The New National Era* in Washington. In 1871 he was appointed secretary of a commission to Santo Domingo, in 1872 was a Presidential elector from New York, and later became marshal for the District of Columbia, recorder of deeds in the District, and United States minister to Haiti. His autobiography is published under the title, *Life and Times of Frederick Douglass.*

DOUM, *doom,* **PALM.** See DOOM PALM.

DOVE, *duv,* the name applied to the smaller and especially attractive species of pigeons, which, as symbols of love, gentleness, innocence and peace, hold a prominent place in religion, literature and art. Among the birds to which the name has been given are the mourning, ring, ground and scaled doves. To North American residents the best known of these is the *mourning dove,* a member of the turtle dove group (see TURTLE DOVE). The mourning dove, which is found from Quebec to Panama, is so named because of the soft,

THE COMMON DOVE

plaintive, cooing notes with which the male wooes his mate. This bird is about a foot long, and wears a modest coat of fawn color, varying to bluish-gray. In appearance it resembles the wild pigeon. The mourning doves are devoted lovers but careless housekeepers, for the two pretty white eggs are laid in a flimsy nest consisting only of a few sticks loosely thrown together. Sometimes this makeshift home is built on top of a robin's deserted nest. The birds feed on grains and grass and weed seeds. See PIGEON.

There is frequent mention of the dove in the Bible. It was this bird that Noah sent out from the Ark to see if the waters had receded, and which returned with an olive leaf to tell him that the flood was subsiding (*Genesis* VIII). One of these birds rested on the head of Christ after His baptism (*Matthew* III, 16), and later in His ministry He overthrew the seats of those that sold doves in the Temple. In the days of the early Christian Church likenesses of doves, generally with an olive branch, were carved on numberless tombs in the catacombs of Rome and elsewhere, to symbolize eternal peace (see CATACOMBS). At the present time the "dove of peace" is a common feature of cartoons and other pic-

tures representing the end of warfare or the triumph of the principles of peace.

DO'VER, an English seaport, sixty-seven miles southeast of London, on the northern shore of the Strait of Dover. It is beautifully situated, backed by the famous "white cliffs of Dover." On the cliffs to the east of the

CITY AND STRAIT OF DOVER

town stands a castle, founded during the ancient Roman occupation of Britain, and now strongly garrisoned. Stairs tunneled in the cliffs lead from the shore to the fortifications, the road for wheeled traffic taking a long, winding course to the top of the cliffs, 350 feet in height. The harbor is protected by a pier a half mile in length. Calais, the nearest French port, is only twenty-one miles distant, and the fast mail boats accomplish the passage across the strait in slightly over one hour; for this reason Dover is the most important center of traffic with France. It is not a manufacturing town, but conducts a large miscellaneous trade with Belgium, Holland, France and other European countries. Population in 1921, 39,985. See illustration of cliffs, in article ENGLAND.

Strait of Dover, a narrow channel connecting the Atlantic Ocean with the English Channel and separating England from France at their nearest points. It is very shallow, averaging less than 100 feet in depth. The passage from Dover to the French port of Calais, the nearest English and French shores, is greatly dreaded, as the sea is usually rough, and violent storms are frequent. For many years the chief ambition of noted British swimmers was to swim the Channel. The feat was first accomplished in 1875 by Captain Webb, who was in the water for twenty-one and a half hours. A plan for connecting England and France by a tunnel beneath the strait has been repeatedly presented to the two governments but has always been opposed, chiefly for military reasons. As an engineering project it would not be a difficult undertaking.

DOVER, DEL., the capital of the state and the county seat of Kent County. It is on the Saint Jones Creek, near the geographical center of the state and about nine miles from the coast. Wilmington is forty-eight miles north. Transportation is provided by the Pennsylvania Lines (Delaware division). The place was settled as early as 1717. In 1777 it superseded New Castle as the capital of the state, and in 1829 was incorporated as a town. In 1916 the population was 3,720.

Dover is built on high ground and has wide streets crossing each other at right angles. Most of the buildings are constructed of brick, the most prominent being the capitol, built more than 200 years ago, the courthouse and the Federal building. There are also two very old churches, Christ Church (Protestant Episcopal) and the Presbyterian. Besides the public schools, the city has the Wilmington Conference Academy and the State College for colored students, the state library, containing about 50,000 volumes, and a public library. Dover was the birthplace of Caesar Rodney, an American patriot, and his home and a monument erected to his memory are features of interest. The surrounding country produces an abundance of small fruits, and the people of the city are largely engaged in canning fruit, vegetables and meat, especially poultry. The making of baskets and crates is a related industry.

DOVER, N. H., the oldest city in the state and the county seat of Strafford County. It is situated in the southeastern part of the state, at the head of navigation of the Cocheco River, where it meets the waters of the Bellamy River. Portsmouth is eleven miles southeast. Three railway lines serve the city—the Boston & Maine, the Dover & Lakeport and the Portsmouth & Dover; street railway lines communicate with cities north and east. In 1920 the population was 13,029, about the same as in 1910. The area exceeds twenty-six square miles.

Dover is a manufacturing city, largely engaged in making cotton and woolen cloth, boots, shoes, machinery and printing presses; the extensive print works have an output of 30,000,000 yards annually. Within the city's limits the Cocheco River has a direct fall of thirty feet, and its water power is utilized by the manufacturing plants. There are many handsome buildings, the most notable being a $100,000 Federal building, a $225,000 city hall, a public library with over 34,000 volumes, jointly provided by the city and Andrew Carnegie, Wentworth Hospital and the Woodmen

Art Institute. The Strafford Bank is said to be the oldest savings institution in the state.

Dover was settled in 1623, and named for Dover, England. In 1641 it passed under the jurisdiction of Massachusetts, and so remained for fifty years. A city charter was granted in 1855. In the spring of 1896 a flood washed away several bridges, but they have been replaced by modern structures.

DOW, *dou,* NEAL (1804-1897), a Quaker temperance reformer, born in Portland, Me., known as the "father of the Maine law," and one of the most effective temperance advocates in American history. He was educated at the Friends' School in New Bedford, Mass., subsequently becoming a merchant and rising to a high position in the business and political life of his native city. The temperance question, however, was his chief interest, and he was an ardent champion of the prohibition of the manufacture and sale of intoxicating drinks. In 1851, the same year that he drafted Maine's famous prohibitory law, he was elected mayor of Portland and was reëlected in 1855. In 1858 he served in the state legislature. Early in the War of Secession he became colonel of the 13th Volunteer Infantry and was commissioned brigadier-general of volunteers in 1862. In the attack on Port Hudson he was twice wounded, was taken prisoner, and spent eight months in Libby Prison. At the close of the war he traveled in the United States, Canada and Great Britain, organizing prohibition leagues, and through his efforts the prohibition amendment was added in 1884 to the Maine constitution. The National Prohibition party made him its candidate for President in 1880.

DOW'DEN, EDWARD (1843-1913), an English educator and literary critic, one of the most distinguished of modern Shakespearean scholars. He was born in Cork, Ireland, and was educated at Trinity College, Dublin, where he began teaching oratory when he was twenty-four years of age. Later he was appointed professor of English literature in the college, a position which he held until his death. His scholarly *Shakespeare: His Mind and Art,* which was published in 1875, gave him a reputation that was fully sustained by succeeding volumes of literary biography, criticism and history. Notable among these are *The Shakespeare Primer,* a treasure-house of information in concise form; *New Studies in Literature;* a *Life of Shelley; Introduction to Shakespeare,* and *A History of French Literature.* He also edited Shakespeare's sonnets and several of his plays, and the poetical works of Shelley, Wordsworth and Southey.

DOW'IE, JOHN ALEXANDER (1847-1907), a religious organizer and teacher, who had a remarkable career in America as the founder of a church based on his doctrine of healing by faith. He was born in Edinburgh, Scotland, began his religious work as pastor of Congregationalist churches in Sydney, Australia, and later took up evangelistic work because of his conviction that it was wrong for a minister to accept a salary. About 1882, when he established a tabernacle in Melbourne, he became a convert to the doctrine that bodily ills should be healed by the "prayer of faith." Six years later he emigrated to the United States to organize a church which should be founded on his beliefs.

Establishing himself in Chicago, he gained thousands of followers, and by 1896 his Christian Catholic Church had become widely known. In 1901 he moved its headquarters to Zion City, forty-two miles north of Chicago, a community founded on the prairie, which at once grew to a town of several thousand people. In that city he established a publishing house, a bank, a college, many charitable institutions and various industrial works, famous among which is a great lace factory now owned by Marshall Field & Company. Over all of these enterprises, and over the conduct of his people, Dowie exercised the power of a dictator. He forbade many things commonly practiced elsewhere; for example, he denied men the right to smoke within the city limits, and he decreed that no one might dance or play cards. When, in 1906, a revolt of his followers deposed him, he was planning to extend the influence of his Church throughout the world. Previously he had announced himself as Elijah II. A year after his fall from leadership he died. Wilbur Glenn Voliva succeeded him in the post of chief authority.

DOYLE, *doil,* SIR ARTHUR CONAN (1859-), a British novelist who created one of the most widely-known characters in modern English fiction—the fascinating detective, Sherlock Holmes. The stories in which he appears—*A Study in Scarlet, The Adventures of Sherlock Holmes, The Hound of the Baskervilles* and others—are more than ingenious detective tales, for they show the author's humor, insight into character and sense of the dramatic, and at times are enveloped in an atmosphere of horror and mystery that is suggestive of Edgar Allan Poe.

Doyle was born in Edinburgh and studied medicine in the university of that city and in Stonyhurst College (England). He practiced as a doctor at Southsea between 1882 and 1890, making an attempt at story-writing in the meantime, and winning success in 1887 with *A Study in Scarlet.* This was followed by its companion volumes and by several historical novels, including *Micah Clarke, The White Company, The Adventures of Gerard* and *Sir Nigel;* the last is considered by many critics to be his best work in historical fiction. *Round the Red Lamp, The Stark Munro Letters* and *The Green Flag and Other Stories* are short stories; he has a book of poems called *Songs of Action* and a play entitled *Halves.* Among his late books are *The Poison Belt, The New Revelation, The Vital Message* and *History of the Great War.*

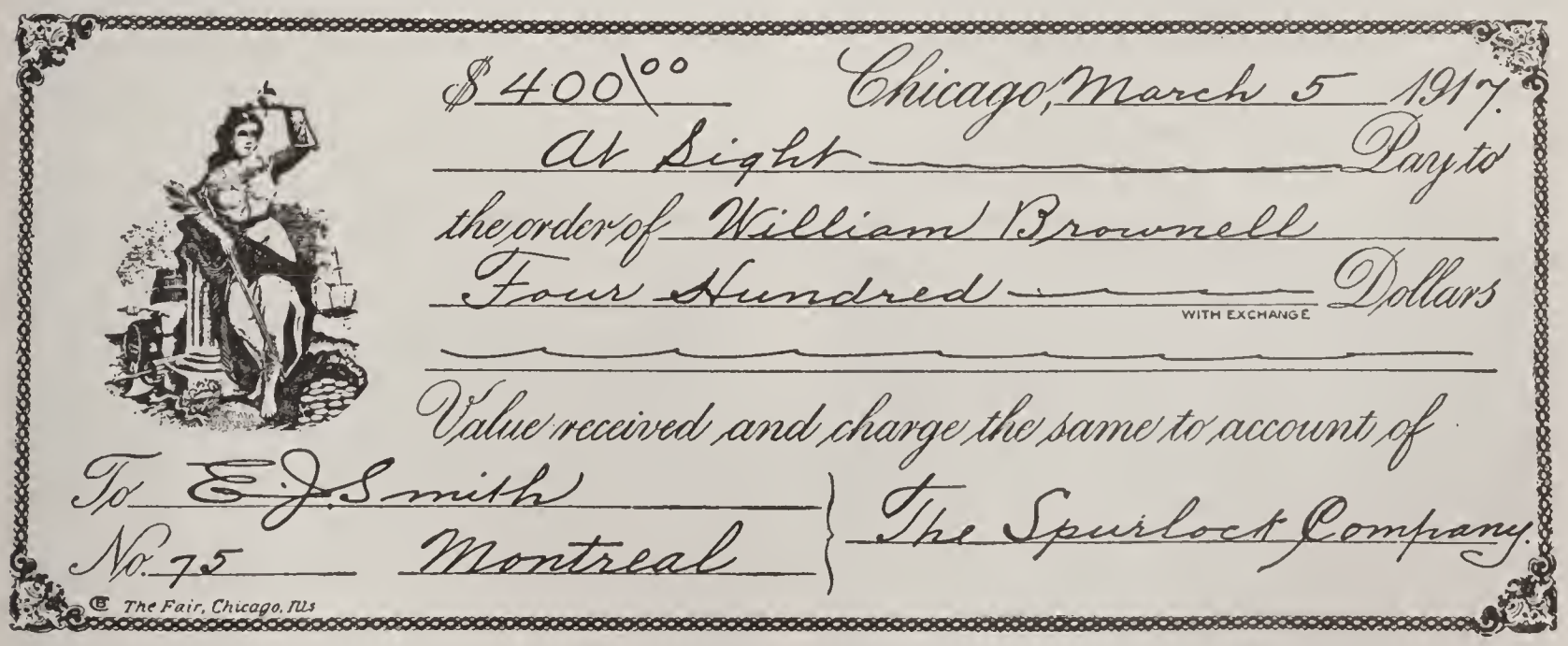
A. CONAN DOYLE

Doyle gave his services to England during the Boer War, acting as senior physician of a field hospital, and on his return home published *The Great Boer War,* a military history of the struggle. Later he vigorously upheld the British policy in South Africa in *The Cause and Conduct of the War,* a book widely read, and translated into twelve languages. In 1902 the British government knighted him in recognition of his distinguished services to his country.

DRACHMA, *drak'ma,* the name of a silver coin which is the monetary unit of Greece. It is of the same value as the French franc and is worth 19.3 cents in United States and Canadian money. A drachma is divided into 100 *lepta,* each worth .193 cent (nearly two mills). Among the ancient Greeks the drachma was also the unit of weight. It varied considerably in different localities and has only recently become standardized. The modern drachma in weight is equal to the metric *gram,* or 15.433 grains. See COINS, FOREIGN.

DRACO, *dra'ko,* an Athenian statesman and legislator who in 621 B.C. drew up a code of the common law of Athens. These written laws in no way altered the laws already established, but when written they appeared so harsh that they were said to have been written in blood. The only penalty named was death, no matter what the offense. Solon later altered many of these laws, but retained the death penalty for murder. It is said that Draco met his death at Aegina, being accidentally smothered in a theater beneath the great number of garments and caps thrown on him by the over-enthusiastic people.

DRAFT, the name popularly given to any bill of exchange (which see), and more particularly to a bill of exchange drawn by one bank on another in favor of a third party. With the exception of the check, the draft is the form of negotiable paper most commonly in use in ordinary business transactions. Its use is easily illustrated by an example. Mr. A in New York owes $500 to Mr. B in Toronto.



ONE FORM OF DRAFT

In case The Spurlock Company did not owe William Brownell, yet wished to draw on Smith for $400, in place of Brownell's name as payee there could be written the name of the bank with which the drawer does business. The bank then would send the draft to a Montreal bank for presentation and payment.

Mr. A has money in New York, but not in Toronto. So he goes to his New York bank, which has money on deposit in a Toronto bank or whose credit with it is assured, and gets a draft for $500, made payable by the Toronto bank to Mr. B. When B gets the draft he presents it for payment at the Toronto bank. The latter makes the payment and in turn charges the amount to the New York bank. In this way A's debt is discharged.

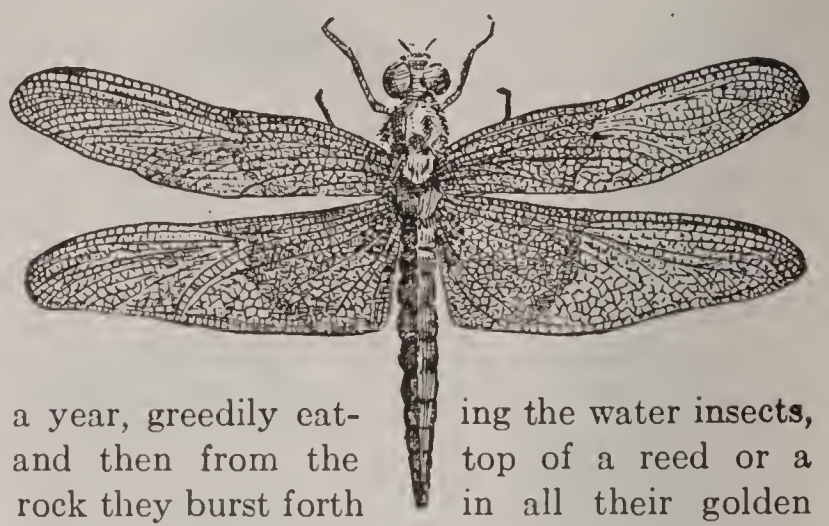
A draft, on the other hand, may be used in another way to secure payment of money. Suppose the Spurlock Company of Chicago owes William Brownell of Montreal, and that E. J. Smith, also of Montreal, owes the Spurlock Company. The latter may write such a draft as is shown in the illustration and tender it to Brownell in payment of its debt to him. When Smith pays Brownell as requested, a three-cornered indebtedness is cancelled. If a draft reads "pay *at sight*" or *"on demand,"* a debtor must at once either pay the amount of the draft or reject it. If the draft is payable in sixty days he may *accept* it, thereby agreeing to pay it. His acceptance is indicated by the word *Accepted* and *his signature* on the face of the draft. After the draft is accepted he is legally responsible for its amount, for it is then, in effect, a note. If he fails to pay at the time fixed, he may be sued without further notice. See, also, CHECK; NEGOTIABLE PAPER.

DRAFTING. See CONSCRIPTION.

DRAGON, *drag'un,* a name which most commonly belongs to the harmless East Indian *flying lizard,* of beautiful, butterfly hues, but is also applied to various tree-lizards of Southern California, South America, Asia and Africa. The *flying lizard* is about eight inches long.

In legends and myths the dragon is the emblem of evil, and in Christian art it is pictured as a fierce, winged crocodile, breathing fire. The Chinese regard the dragon as a divinity, and have adopted it as their imperial emblem.

DRAGON FLY, a beautiful water insect, with large, long, gauzelike wings that give it powerful and rapid flight. A "glimmering, glittering flutterer fair," dressed in beautiful greens and blues and browns, it is as attractive and interesting as the butterfly. It has very large beadlike eyes and a long, slender body, and is widely known as the *devil's darning needle.* To this always-hungry but absolutely harmless insect are attributed many strange actions. It feeds merely on other insects, chiefly mosquitoes and flies, and usually catches and eats them while flying over the ponds or marshes where it lives. It is therefore a benefit to humanity. The dragon fly lays its eggs in the water, where the pupae (young) live for



a year, greedily eating the water insects, and then from the top of a reed or a rock they burst forth in all their golden beauty. Dragon flies migrate like birds, but the reason for their flight has not been determined.

DRAIN'AGE. How many farmers would believe you if told that they could increase the size of their farms without enlarging their boundaries? The proposition seems absurd, yet it is a fact that the average farm could be increased in *depth.* The deeper the roots of a plant penetrate the soil the more nourishment they can extract, and artificial drainage, by lowering the level at which water saturates the soil and shuts out air, enables roots to thrive farther below the surface. A farmer ought not to be content with having his fields free from standing surface-water; if a post hole four or five feet deep contains water during part of the growing season he will gain by installing a drainage system.

In a large part of the United States and Canada rain falls more rapidly than evaporation, natural drainage, seepage through the soil and absorption by plants can dispose of it, and the line of saturation, called the *water-table,* is not very far below the surface. In clay soil moisture rises more than four feet above the water-table just as ink climbs in a piece of blotting-paper (see CAPILLARITY), and in sand it rises nearly two feet.

The Best Way to Drain. Open ditches are seldom satisfactory on a farm. They remove part of the tillable area, obstruct movement and sometimes become filled with weeds and breed mosquitoes. Underground drains are much more effective, especially when built with hollow tile.

There are no fixed rules for the laying of underground drains. The character of the soil, the lay of the land and the amount of water to be carried must be considered in each case.

Generally, the main drain will follow the principal hollows in the field, the depressions through which rain water runs off. The branch drains enter the main drain at right angles, and are placed from twenty feet apart in wet clay to eight feet apart in sand, and from two and a half to five feet below the surface. Drains near the surface must be placed closer together than deeper ones. The tiles in common use vary from three to eight inches in inside diameter, and are laid with their ends close together but not sealed, in order that water, but no dirt, may find its way in. They should slope at least three inches in a hundred feet. Two branch drains must not enter the main opposite each other, and the mouth of the main drain, if it discharges into a stream, must be above the highest level of the stream water.

Reclaiming Low Lands. Some of the best farming land in the world is that which, but for artificial drainage, would be under water. Everyone knows the story of the brave Hollanders' centuries-long struggle with the sea, but the Dutch *polders* form only a small part of the immense domain which men have added to the dry land which nature gave them. The fen lands of the east coast of England were partially drained in Roman days, and in modern times thousands of acres more have been reclaimed. On the continent of Europe the most important drainage project is in the Po Valley in Italy, where a thousand square miles of marsh have disappeared. The delta of the Nile, too, is being drained, and in America 6,000 square miles of the once impenetrable Everglades of Florida are being transformed into fertile farms. See EVERGLADES. C.H.H.

DRAINAGE CANAL. See CHICAGO DRAINAGE CANAL.

DRAKE, SIR FRANCIS (about 1540-1596), an English navigator and adventurer, the first Englishman to circumnavigate the globe. To this man of determination and energy was also largely due another honor, that of the defeat of Spain's "Invincible Armada," which gained for England command of the ocean (see ARMADA). He was born in Devonshire and early in life served as a sailor in a coasting vessel. In 1567, on Sir John Hawkins' last expedition against the Spaniards, in which he invested heavily, he lost most of his possessions. To avenge this defeat and loss, after two preliminary voyages to the West Indies, he set out in 1572 against Spain with three ships and seventy-three men. With this small force he captured a Spanish town and large treasure on the Isthmus of Panama, thereby earning the name of "the Dragon" from the Spaniards.

SIR FRANCIS DRAKE

Five years later, with four vessels, he started on his most famous voyage, during which the coasts of Chile and Peru were plundered, several ports sacked and a Spanish galleon laden with silver, gold and jewels captured. After many hazardous experiences, only his own vessel, the *Pelican,* renamed the *Golden Hind,* was left to complete in three years the then marvelous feat of going around the world. On November 3, 1580, he anchored in Plymouth harbor, having completed a voyage that now takes but six weeks. The *Golden Hind* was long preserved, but only a chair made from its timber, one of the relics of Oxford University, now remains.

DRAMA, *drah'ma,* a term derived from a Greek word meaning *action,* is applied to that form of literary composition which is intended to be presented upon a stage by actors who impersonate characters in the development of a story. In its written form a drama or play consists of the speeches of the characters, grouped into divisions and subdivisions

known as *acts* and *scenes*. When presented on a stage the story is developed by means of speech, action and gesture, and with the aid of stage scenery and furnishings. The term *drama* is also applied to the entire body of dramatic writings of any people or period, as the English drama, medieval drama, and the like. The dramatic writings of nearly all nations are an important part of their literature.

Plays are written both in prose and in poetry. The Greeks, who originated European drama, considered this form of literature one of the divisions of poetry, and Shakespeare's plays are for the most part written in verse; but in modern times prose has been more generally used than poetry as a medium for dramatic composition. The two great divisions of the drama are *tragedy* and *comedy*. Tragedies are plays with a gloomy ending, in which the sad or terrible in life is emphasized; in a comedy the outlook on life is gay or cheerful, and there is a happy conclusion. Shakespeare's *Hamlet* is a tragedy; his *Twelfth Night* is a comedy.

American Drama. America has produced an extensive dramatic literature, though much of this is not of high value. American dramatists have shown the greatest activity in the period beginning about 1880. In the latter part of the nineteenth century a form of play became popular in which the interest is centered upon native types of character rather than upon the plot. Denman Thompson's *Old Homestead* (1886) and James A. Herne's *Shore Acres* (1892) are well-known plays of this type. Bronson Howard (1842-1908), one of America's most able dramatists, is remembered for his attractive and spirited comedy, *The Henrietta* (1887), revived in 1913-1914 as *The New Henrietta,* and for his popular war drama *Shenandoah* (1889). Augustus M. Thomas (born 1859), whose fondness for local color is shown in his most popular plays, *Alabama, In Mizzoura* and *Arizona,* also achieved success with a striking play dealing with the power of hypnotism, *The Witching Hour*. Among other well-known plays is his *As a Man Thinks*.

Notable work has also been done by William Gillette (born 1855), who made an able dramatization of Doyle's *Sherlock Holmes* and won a high place for himself in the dramatic world in its title rôle. *Secret Service,* a drama of the War of Secession, and *The Private Secretary,* a delightful and entertaining comedy, are among his other successes. The drama of social life has been represented by Clyde Fitch (1865-1909), notably in *The Climbers, The Truth* and *The Girl with the Green Eyes*. He produced more plays during a brief career than any other American. Typical phases of modern American life have been treated by Eugene Walter (born 1874) in *The Easiest Way, Paid in Full* and *Fine Feathers,* and Edward Sheldon (born 1886) gave a realistic portrayal of slum life in *Salvation Nell*. The well-known theatrical producer and manager, David Belasco (born 1859), has written a number of successful plays, notably *The Heart of Maryland* and *The Girl of the Golden West*.

The chief representative of the poetic drama is Percy Mackaye (born 1875), whose *Jeanne d'Arc* and *Sappho and Phaon* show literary merit. William Vaughn Moody, who died in 1910, gave promise of unusual power in his *Great Divide* (1907), possibly the most artistic of all American prose dramas.

The American drama has reached a higher standard of excellence in its players than in its plays. Among the earlier artists, the names of Edwin Forrest, Edwin Booth, Lawrence Barrett and Richard Mansfield shine brilliantly. Joseph Jefferson, whose portrayal of Rip Van Winkle is one of the cherished traditions of the American stage, was long a well-loved figure in the theater.

Notable among later artists are John Drew, Edward H. Sothern, Robert Mantell, William Gillette, William Faversham, William Crane, Henry E. Dixey, Nat Goodwin, Francis Wilson, Maude Adams, Julia Marlowe, Annie Russell, Minnie Maddern Fiske and Mrs. Leslie Carter.

Some Present-Day Difficulties. The American theater since 1910 has shown the effects of rather extraordinary conditions. One of the most commonly-heard complaints on the part of the theatrical producers is that the regular theater no longer enjoys the popularity it once commanded. Undoubtedly the immense vogue of the moving picture and vaudeville programs has diverted the public from the regular playhouses, where, it is generally admitted, the prices charged are often excessive. Plays of genuine merit are the exception, and a person who has paid well to see an inferior play poorly acted is not inclined often to repeat the experiment.

The formation of a theatrical combination, known as the "Syndicate," has also affected the situation. This combination of theatrical managers controlled in 1896 thirty-seven first-class theaters; by 1915 nearly all the standard playhouses in the United States had passed under its control. To the producer the Syndi-

AN OUTLINE ON THE DRAMA

I. Forms

(1) Tragedy—the loftiest form
  (a) Subject-matter—grave
  (b) Language—dignified
  (c) Object—as phrased by Aristotle, "to purify the passions"
(2) Comedy
  (a) Less serious than tragedy
  (b) Language and treatment lighter than in tragedy
  (c) To amuse, or occasionally to ridicule
(3) Farce
  (a) A form of comedy, more extravagant than the latter. Comedy generally aims at realism; farce introduces obvious absurdities
  (b) Motive, to excite laughter
(4) Burlesque
  (a) A ludicrous treatment of serious matters, or a dignified, lofty treatment of unimportant things
  (b) Motive, originally to correct abuses or absurdities through ridicule
(5) Opera
  (a) Drama set to music
  (b) Divisions
    1. Grand opera—serious or classical themes, usually like those of tragedy
    2. Light opera—fanciful or humorous, or even comic. Music lighter and less impressive than in grand opera
(6) Transition forms, now practically obsolete
  (a) Mystery plays—based on Bible stories
  (b) Miracle plays—dealing with the life of some saint
  (c) Morality plays—moral teaching in dramatic form, the characters representing the virtues and vices
  (d) Pastoral—a presentation, usually idealized, of rural scenes and happenings

II. Historic Development

(1) Among the Hebrews
  (a) *Job* and *Song of Solomon* practically dramas
(2) In India
  (a) Drama reaches far back, but has never reached the high plane of Greek or later European dramatic writing
(3) In China
  (a) Very long and complex dramas
  (b) Unknown to people outside of China
(4) In Greece
  (a) Greeks originated both forms, tragedy and comedy
  (b) Tragedy religious in its beginnings, an outgrowth of the worship of Dionysus
  (c) Comedy, similar in its origin, but growing out of the rural festivals
(5) In Rome
  (a) Largely imitation of Greek drama
  (b) Its influence, rather than that of Greek drama, felt in later European literature
(6) Italy
  (a) Classic model strictly adhered to during early period
  (b) Age of the pastoral drama, during fourteenth, fifteenth and sixteenth centuries, foremost period
  (c) Seventeenth century saw a lessening of interest, but the following century was marked by a decided revival.
  (d) It was from Italy that English dramatic tradition which resulted in the wonderful dramas of the Elizabethans was derived
(7) France
  (a) Corneille real founder of French drama, which amounted to little before his time
  (b) Racine and Molière next outstanding names
  (c) Classic school represented by these writers remained dominant until the early nineteenth century, when Hugo became the leader of a new school, the romantic
(8) Germany
  (a) Early dramas all modeled on French; many merely translated from French
  (b) Lessing first to break away from French tradition
  (c) Goethe and Schiller culmination of dramatic writing in Germany
(9) England
  (a) Most brilliant period that of Queen Elizabeth; Marlowe, Jonson and Shakespeare greatest writers
  (b) Theaters closed by Puritans
  (c) Drama of the Restoration—Dryden chief figure
  (d) Excellent comedies of eighteenth century
  (e) Present-day tendencies
(10) Canada
  (a) Some original productions of merit, but most of the dramas brought from England
(11) United States
  (a) No plays to rank with great productions of English dramatists
  (b) "Character" plays
  (c) Realistic dramas of modern life

cate says, "You must book your plays in our theaters, or they will get no hearing"; and to the actor, "You must play in our theaters, or you will get no employment." Such a system tends to discourage independence on the part of the actor, and it reacts on the playwright. An outsider cannot get his plays produced in any theater which will insure him a wide hearing. Furthermore, the members of the Syndicate have a tremendous influence with the press, and in some cases they control dramatic critics. In New York a theatrical manager may forbid a dramatic critic who has criticised one of his productions to enter his theater.

The Beginnings of European Drama. Many centuries before the Christian Era the ancient Greeks were accustomed to celebrate with music and dance the festival of Dionysus, their god of wine, and the Greek drama was the outgrowth of the songs of the festival chorus (see CHORUS). Verses and dialogues were introduced in the course of time, and early in the sixth century B.C. an actor was added to the chorus. Aeschylus (525 B.C.), the first great writer of tragedy, introduced a second actor; he was also the first to make use of appropriate scenery and costumes. As time passed the chorus became secondary to the action of the play, and Sophocles, one of the successors of Aeschylus, introduced a third actor. Aeschylus, Sophocles and Euripides formed the great trio of tragic poets.

Comedy, which developed side by side with tragedy, was the outgrowth of the fun and frolic of the rustic festivals held in honor of Dionysus. Early in the history of comedy the chorus disappeared. Ancient Greek tragedy was religious in character; comedy was used to hold up to ridicule the prominent men of the day, and from this phase it passed to the ridicule of the weaknesses of humanity in general. The greatest of the Greek writers of comedy was Aristophanes. His greatest comedy is undoubtedly *The Clouds,* in which Socrates is ridiculed.

The Middle Ages. The typical dramatic forms of medieval Europe had their birth in the services of the Christian Church. In order to make the Bible teachings more vivid and impressive, the clergy began to present the chief episodes in the life of Christ in the form of little plays, especially during the celebration of the great festivals of Easter and Christmas. Gradually these plays were banished from the churches, and were performed on the streets and in the public squares by actors.

Three important forms of the medieval drama developed: the *mystery play,* based upon Bible stories centering particularly about the life of Christ; the *miracle play,* a series of episodes taken from the life of some saint; and the *morality play,* which was really a sermon in dramatic form, its characters being types of certain virtues and vices. *Everyman,* one of the best morality plays in English, was revived in 1902 and 1903 in England and America by the Ben Greet players. *The Passion Play,* performed every tenth year at Oberammergau, is a form of mystery play.

The Drama in England. The various forms of the religious drama were long popular in England, but in the fifteenth century the revival of learning awakened an interest in the old classic plays, and the regular English drama began to take form. Schoolmasters trained their pupils to act the comedies of the Roman dramatists, Terence and Plautus, and about 1536 Nicholas Udall, head master of Eton, wrote the first English comedy, *Ralph Roister Doister.* This was followed fifteen years later by the first English tragedy, *Gorboduc.*

During the reign of Queen Elizabeth the English drama reached its highest degree of excellence in the plays of Shakespeare. With the passing of the Elizabethan Era the drama began to decline. In 1642 the theaters were closed by the Puritans, but on the restoration of Charles II in 1660 interest in them revived. The chief dramatist of the Restoration Period was John Dryden, whose plays, as well as those of his contemporaries, reflect the coarseness and corruption of the age in which they were produced. The eighteenth century produced admirable examples of the English comedy of manners, notably Richard B. Sheridan's *The Rivals* and *The School for Scandal,* and Oliver Goldsmith's *She Stoops to Conquer.*

The poetic plays of Tennyson, Swinburne and Browning, though not suited to presentation on the stage, are excellent representatives of the nineteenth-century literary drama. Notable writers of the acted drama include Bulwer Lytton, Shirley Brooks, Charles Reade, Dion Boucicault, Oscar Wilde and W. S. Gilbert.

Prominent English dramatists of the modern period are Bernard Shaw, Granville Barker, Somerset Maugham, Haddon Chambers, Henry Arthur Jones, Arthur W. Pinero, James A. Barrie and John Galsworthy. Shaw is the most brilliant and original of those dramatists who aim to give on the stage a picture of the life and characteristics of the times, and he has become an international figure. C.W.K.

MIDSUMMER NIGHTS DREAM. (1) The bewitched fairy and her lover. (2) Preparing for that "most lamentable comedy." (3) The fate of Hermia hangs in the balance.

Courtesy of
Florence Holbrook

MIDSUMMER NIGHTS DREAM. (1) The fairy queen. (2) "Fair lovers, fortunately met"—happy at last. (3) Puck and the fairies.

Shakespearean Drama in Schools

One of the best and most enjoyable exercises for a class is the presentation of a play. All children like to "make believe," and knowledge of a play is best obtained by the endeavor to memorize the lines and to present the thought by appropriate intonation and gesture. No more time is required to present a good literary play than a worthless, transitory effort; young people should therefore be encouraged to select some play of recognized merit. One of the simplest and most charming of all plays for children is the wonderful fairy play of Shakespeare, *Midsummer Night's Dream.* The ideal way is to have a class give this play after it has been carefully studied in school as part of the regular work in literature. The students are then familiar with the entire play and can easily memorize the beautiful lines. High school classes have presented it well, while children in the seventh grade, under twelve years of age, have given the play in a most acceptable and enjoyable performance, delightful in its quaint conceits and humor as well as in its beauty of expression.

The play is easily staged, as all the action, except the first and last scenes, takes place in the forest. A dark-blue curtain as the background, with a tree trimmed with pink paper to represent a blossoming cherry tree, four sloping benches covered with green for the resting places of the tired wanderers in the wood, and a throne for Titania and Bottom, her grotesque lover, complete the forest setting. The stage may be thus arranged, and no drop curtain is necessary. The first scene may be given at the front of the stage, close to the audience. In the last scene the throne should be covered with white for the throne of the duke and duchess; the four green benches should be removed and a classic white bench should be placed for the seats of the lovers as they enter to the presentation of that "most lamentable comedy," Pyramus and Thisbe.

Costumes. There are three groups in the play. These are the *courtiers,* who wear handsome Greek dresses of various colors, made of crêpe cloth and trimmed with the Greek border; the *clowns,* who wear plain, short-skirted slips of dark colors, with dark hose and sandals; and the *fairies,* who should wear sheer garments and wings trimmed with silver and gold. Puck should wear scarlet and have winged cap and sandals; a fairy should wear pale blue, trimmed with silver; the four fairy attendants of Titania should be tiny boys dressed in colors appropriate to their names and wear huge wings and wreaths of flowers. The ass's head that Bottom wears in the forest, the lion's head, the crowns and Oberon's wand may be rented from a costumer. The lantern, bush of thorn and dog that Moonshine must have can easily be obtained. The little children who give the roundel should wear cheesecloth in soft colors, while the dance that follows the play in the last act may be given by other dancers in white costumes. The girls in the sewing classes should make all the dresses. Egeus should wear a white beard and wig. Thisbe should have the long dress of a Greek lady, and the clowns should have swords. Flute should have a bag with the scrolls for the actors and one much longer scroll for the calendar.

The four fairies, taken from the kindergarten or first grade; the dancers, from the third and fourth grades, and the other actors from the sixth and seventh grades, serve to interest many children in the presentation. The story of the play should be told to the younger classes by the members of the class that has studied it, that they may better appreciate its presentation.

One invaluable result of presenting such a play is that the study and time are not misspent. The world of literature will always be better known and more highly enjoyed because of this early excursion into one of its most alluring paths. F.H.

Consult Hunt's *The Play of To-day;* Moses' *The American Dramatist;* Eaton's *The American Stage of To-day.*

Related Subjects. These volumes contain many articles which throw light on the subject of the drama:

GENERAL

Becky Sharp
Burlesque
Camille
Comedy
Farce
Figaro
Hamlet
Macbeth
Masque
Melodrama
Midsummer Night's Dream
Miracle Play
Morality Play
Mystery Play
Opera
Passion Play
Rip Van Winkle
Theater
Tragedy

DRAMATISTS

Ade, George
Aeschylus
Alfieri, Vittorio
Aristophanes
Beaumarchais, Pierre Augustin Caron de
Beaumont, Francis and Fletcher, John
Belasco, David
Boucicault, Dion
Corneille, Pierre
Daly, John Augustin

Dryden, John
Dumas, Alexander
Euripides
Fitch, Clyde
Galsworthy, John
Gilbert, William Schwenk
Goethe, Johann Wolfgang von
Goldsmith, Oliver
Halevy, Ludovic
Hauptmann, Gerhart
Herne, James A.
Ibsen, Henrik
Jones, Henry Arthur
Jonson, Ben
Lesage, Alain René
Lessing, Gotthold Ephraim
Maeterlinck, Maurice
Marlowe, Christopher
Molière
Pinero, Arthur Wing
Plautus, Titus Maccius
Racine, Jean
Rostand, Edmund
Sardou, Victorien
Schiller, Johann Friedrich Christoph von
Scribe, Augustin Eugène
Shakespeare, William
Shaw, George Bernard
Sheridan, Richard Brinsley
Sophocles
Strindberg, August
Sudermann, Hermann
Synge, John Millington
Terence
Thomas, Augustus
Udall, Nicholas
Vega Carpio, Felix Lope de
Yeats, William Butler

ACTORS

Adams, Maude Kiskadden
Anderson, Marie Antoinette
Anglin, Margaret
Arthur, Julia
Barrett, Lawrence
Barrymore
Bates, Blanche
Bernhardt, Sarah
Booth
Carter, Mrs. Leslie
Coquelin, Benoit Constant
Cushman, Charlotte Saunders
Drew, John
Duse, Eleonora
Elliott, Maxine
Forbes-Robertson, Sir Johnston
Forrest, Edwin
Garrick, David
Gillette, William H.
Goodwin, Nathaniel C.
Hackett, James K.
Herne, James A.
Irving, Sir Henry
Jefferson, Joseph
Kean
Keene, Laura
Kemble, Frances Anne
Langtry, Mrs. Lillie
Mannering, Mary
Mansfield, Richard
Mantell, Robert
Marlowe, Julia
Modjeska, Helena
Morris, Clara
Nazimova, Alla
Nethersole, Olga
Rachel
Rehan, Ada
Ristori, Adelaide
Russell, Sol Smith
Salvini, Tommaso
Siddons, Mrs. Sarah
Skinner, Otis
Sothern, Edward H.
Terry, Ellen A.
Thompson, Denman
Tree, Sir Robert Beerbohm
Warfield, David

DRA'PER, Andrew Sloan (1848-1913), an American educator whose influence was felt from common schools to university, was born at Westford, N. Y. He received his education in the public schools and in the Boys' Academy in Albany. In 1871 he was graduated from the Albany Law School. He served a term in the state legislature in 1881, in 1886 was elected superintendent of public instruction for New York state, then for two years beginning in 1892 was city superintendent of schools at Cleveland, O., where he reorganized the school system. He resigned this position to become president of the University of Illinois in 1894. That institution erected twelve buildings during his administration, and the number of students increased from 750 to 3,900.

In 1904 when the two state educational departments were united in New York he was chosen state commissioner of education. Dr. Draper's achievements during this term of office included the completion of the $4,000,000 state educational building at Albany, the enactment of the law providing supervision for rural schools, the reorganization of the normal schools, the organization of the state examination board and the enactment of a law for state scholarships. In 1902 he became a member of the board of the United States Indian Commissioners. He was the author of the *Rescue of Cuba, American Schools and American Citizenship* and of numerous published addresses.

DRAW'ING. In its larger sense, *drawing* means the graphic expression of an idea. This expression may be pictorial, as in representative drawing, or it may be in the form of a plan or design, as in architecture and ornament. Frequently the term has been used to cover those subjects which were formerly included in the art courses of the public schools. When these courses were restricted to nature drawing, object drawing, perspective, water color handling and that phase of design which we call composition, the narrowness of the name *drawing* did not disturb us. But as changing ideals in public education forced a change in the aims and methods of art teaching in the schools, the term was plainly too limited to cover the field, and a new term was employed. Under the head Industrial Art in these volumes will be found a comprehensive course in art instruction for public schools, covering the modern phases of design and color, in their relation to the drawing and arrangement of all shapes and forms. B.S.

DREAMS, *dreemz,* those fantastic, shadowy mind-pictures which may crowd into a fleeting moment of sleep a train of events which might cover hours or even days if they really happened. Since earliest times, there have been various theories to explain dreams, and they have formed a favorite theme of the poets.

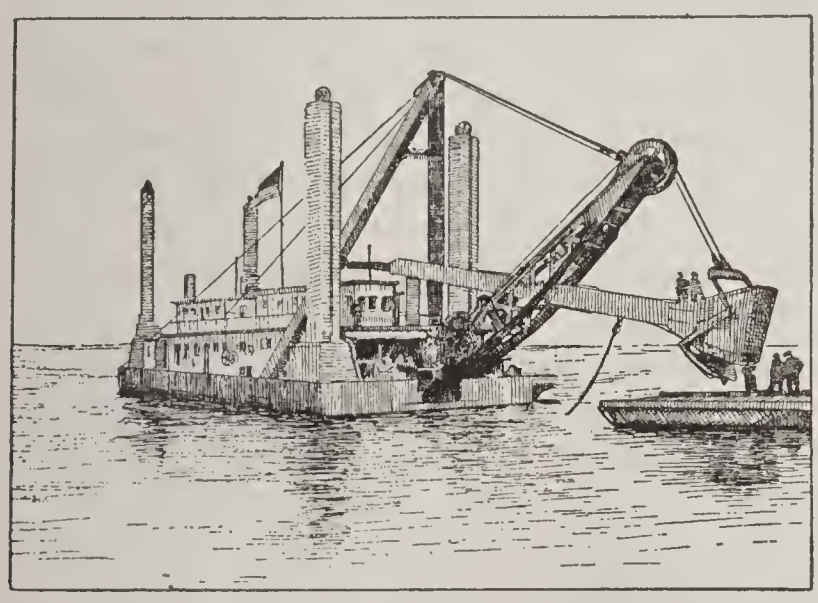
In ancient times, and by the Indians, it was believed that dreams were direct messages from the gods or from the infernal regions, or, as in the Scriptures, direct from God, to be interpreted and acted upon. This belief is still held by the superstitious, but scientists attribute dreams to natural causes, as Swift says in his poem *On Dreams:*

Those dreams, that on the silent night intrude,
And with false flitting shades our minds delude,
Jove never sends us downward from the skies;
Nor can they from infernal mansions rise;
But are all mere productions from the brain,
And fools consult interpreters in vain.

As Dr. Sigmund Freud explains them, dreams are the sleeping mental fulfilment of the unexpressed wishes or desires of the ones who are dreaming. Also they may have a physical cause, as a sensation of cold while sleeping may cause one to dream of snow storms and freezing. An uncomfortable position or strained muscles may cause a dream of falling or struggling. An undigested meal may bring the most horrible of all dreams, a *nightmare* (which see). Dreams may indicate the condition of a person's health, for the more dreams of which one is conscious the less sound and beneficial is the sleep. It is believed that sleep is rarely free from dreams, although we may not be conscious of them or recall them later.

Day-dreams are mental, unproductive imaginings of the mind awake, and *dreamland,* a fairyland place of delightful fancies. It is said that Coleridge composed *Kubla Khan,* a beautiful fragment of a poem, while partially asleep.

DREDGING, *drej'ing,* the operation of removing obstructions from the bottom of rivers, harbors, channels and other bodies of water to render them navigable. The machines performing this work are known as dredges, and



A DIPPER DREDGE

they operate beneath the water on the principle governing the work of steam shovels on land. The first dredge operated by steam power was used in England in 1796. It consisted of an endless chain to which a number of iron buckets were attached. The chain revolved in a framework, the lower end of which was placed in the water at such a depth that the buckets, while in motion, caught on the bottom and became filled with the substance to be removed. Barges were stationed close to the dredge to receive the contents from the buckets.

The accompanying illustration shows the most effective form of a modern *dipper dredge.* It is really a combination of crane and shovel mounted on a strongly constructed barge. The upright masts support an arm, or derrick, which may be swung in a semi-circle like the boom of a crane. The dipper consists of a metal scoop or box open at the top and closed by a door at the bottom. This dipper is lowered to the bottom and drawn forward with a scooping motion by means of cables which pass over the wheels at the end of the boom. The dipper is gradually raised until it is clear of the water. The boom is then swung until the dipper rests immediately over a barge placed to receive its contents. The door at the bottom is opened by means of a cord attached to a spring fastening and the dipper is emptied. The capacity of the dippers vary, some raising only two or three cubic yards of mud, while the largest, such as were employed in the construction of the Panama Canal, have a capacity of eight and one-fourth cubic yards.

DRED SCOTT DECISION, the conclusion of a noted case bearing on slavery, argued in 1855 and 1856 in the United States Supreme Court. This decision, which was announced on March 6, 1857, by Chief Justice Taney, was of vital importance, because of its influence upon the spread of slavery. Dred Scott, the plaintiff, was a slave of an army officer of Missouri. His owner took him to the free state of Illinois and then to Minnesota, where by the Missouri Compromise (which see), slavery was forbidden; in 1838 he was taken back to Missouri, a slave state.

Scott subsequently learned that by previous decisions of the Missouri courts his residence in a free state made him a free man, and he sued for his freedom in 1848, the local court of Saint Louis County giving a verdict in his favor. The state Supreme Court reversed the decision, and this decision was upheld by the United States Supreme Court, which declared that a slave was merely a chattel and a citizen had the right to take his property wherever he chose, provided it was within the jurisdiction of the United States. The court also decided that no negro could be a citizen of the United States and therefore would have no rights in a court of law. By this decision slavery was practically admitted to every state and territory in the Union; it increased the tense feeling between the sections and proved one of

the important factors that led to the War of Secession. See UNITED STATES, subtitle *History;* War of SECESSION.

DRESDEN, *drez'den,* the city of zest in nature and art, of hearty river life and pleasure, is the capital of Saxony, in what was the German Empire. It is situated in a richly-cultivated valley on both sides of the Elbe River, about 111 miles southeast of Berlin. Because of its delightful situation and its many objects of interest it often is called "the German Florence." Numerous squares and parks dot the city, both in the old and new sections, the largest being the Grosse Garten, in the old quarter, containing a museum of antiquities and a zoölogical and botanical garden. Among its fine promenades is the Brühl Terrace, commanding a charming view of the Elbe and surrounding country, once a part of the city's fortifications before Count Brühl, the all-powerful minister of Augustus II, made them over into his private gardens.

In addition to its imposing churches, Dresden takes pride in its many beautiful public buildings. Among these are the Zwinger, originally intended to be the vestibule of a magnificent palace, but now housing collections of great value, whose northeast wing forms the Museum, containing one of the finest picture galleries in the world; the Augusteum, or Japanese Palace (so named from Oriental figures with which it is decorated), containing the royal library of about 400,000 volumes and a valuable collection of manuscripts and portfolios; and the Johanneum, which in addition to its 15,000 pieces of rare porcelain contains an historical museum with a fine array of arms, armor and domestic utensils belonging to the Middle Ages. The splendid interior decoration of the royal palace and its collections of curiosities, jewels, trinkets and works of art more than compensate for its unattractive exterior; while the prince's palace has a fine chapel and a library of 20,000 volumes. The royal theater is one of the finest of its kind in the world. Dresden is also noted for its excellent educational, literary and artistic institutions, chief among which are the Royal Technical High School, the Royal Music School and the Academy of Medicine and Surgery.

The city is classed among the neatest of the cities of Germany. The municipality owns and manages its water works and its gas and electric plants. In manufactures, which are varied in character, it ranks high, although the china for which the city is famed is chiefly made at the royal factories at Meissen, fourteen miles distant (see DRESDEN CHINA). Dresden suffered severely in the Thirty Years' War, and also in 1813, when Napoleon made it his headquarters. The Prussians occupied it in 1866, but evacuated it in 1867. Population in 1910, 546,882.

Arts and Crafts in Dresden. A large part of Dresden's claim to fame lies in its extensive art, literary and scientific collections. Of these the most valuable is its picture gallery, housed in the Museum of the Zwinger, containing over 2,500 canvases, representative of the Dutch, Italian, Spanish and Flemish masters. Among its prize pictures are Raphael's *Sistine Madonna;* Correggio's *Holy Night;* Titian's *The Tribute Money,* and Rubens' *Boar Hunt.* The museum owes its most valued treasures to Augustus III, who purchased the greater portion of the gallery of the Duke of Modena for $900,000. This treasure storehouse contains also over 300,000 wood cuts and copper engravings; and while its modern gallery is small in contents it is representative of the best of the modern schools. The collection of jewels and royal playthings in the famous Green Vault of the royal palace likewise is famed, as is also the array of ancient and modern arms, implements and costumes in the Museum Johanneum. R.D.M.

DRESDEN CHINA, a delicate, highly-finished porcelain, named from the German city where it is supposed to be manufactured. However, the credit for producing it belongs not to Dresden but to the capable men and women employed at the royal factory at Meissen, fourteen miles from that city. Porcelain china has continued in popular favor ever since it was first made in 1709, when Johann Friedrich Böttger, chemist to the elector of Saxony, discovered the yellowish-white material, called kaolin, of which it is made, in the mines near Meissen.

The delicate lines and gossamer tracery of Dresden china lend themselves effectively to pieces for decoration and many varied uses; its designs are of great variety, and are in relief, in color and in gold. Great steadiness of nerve and accuracy of sight are required of the workmen, each of whom is first thoroughly drilled in exercises of drawing, molding and a general study of forms and colors; and then he passes by gradual promotion from the lowest to the highest position in the department wherein he has specialized. At the Meissen factory are to be found painters whose talent is of a high order. The output includes vases, statuettes, groups in figures and candelabra.

DRESS. The clothing worn by civilized people of to-day is the result of long ages of development. It is supposed that the primitive ancestor of the human race, in the earliest stages of the world's existence, wore no clothing at all. What caused him first to attire himself in the garb of savagery—the plumage of birds and the pelts of beasts, and leaves, bark and shells—has long been an interesting subject for study and controversy. Modern scholars are inclined to accept the theory that the love of adornment, the desire to appear attractive, rather than the sense of modesty, first moved the cave man to adopt his crude form of dress, and that the sense of modesty is the result of the wearing of clothing.

EGYPTIAN DRESS
Ancient water carrier on the Nile.

Whatever the earliest reason for covering the body may have been, as the human race emerged from the shadowy borderland of savagery man made the discovery that clothing was necessary for his comfort and his happiness. Of all the members of the animal kingdom, he is the only one whom Nature has neglected to provide with a natural garment to serve as a protection against the cold of winter and the heat of summer. Lacking the fur of beasts or the feathers of birds, he has learned how to provide for himself artificial coverings.

The story of the evolution of dress is the story of one of the world's mammoth industries; rather, a narrative of many allied industries. Beasts and plants innumerable have been utilized to clothe the human race. Fabrics of almost endless variety are now made from the hair of sheep, camels, alpacas and goats, and from the fibers of such plants as the cotton, flax, hemp and jute; an industrious little worm weaves a glossy thread from which is made lustrous and beautiful silk; the skin of various animals furnishes the leather that goes into the making of boots and shoes; the fur-bearers give their handsome coats that mankind may be protected from the cold. Smoke pouring from the chimneys of factories in every quarter of the civilized world and the whir of great machines, the most ingenious that can be conceived by the human mind, offer witness to the vastness of the problem of keeping mankind clothed. The reader may find the details of the story of clothing in the articles named at the end of this article.

AN ASSYRIAN KING

The Evolution of Dress. In early historic times both men and women wore a costume based on the skirt, now the characteristic garment of woman throughout the temperate regions. Trousers were a later invention. The rich and noble classes among the Egyptians,

Babylonians and Assyrians and other ancient peoples of the Orient adopted some form of long, loose robe, but the laboring people, who would be hampered by trailing skirts, had to be content with a short kilt which reached only to the knee.

About nine centuries before the birth of Christ the Assyrian kings added troops of horsemen to their armies, an innovation which made necessary a new form of dress for these soldiers. Accordingly, the skirt of the rider was split from the hem to the waist in front and back. This divided skirt in the course of a hundred years became a garment with two separate skirts, one for each leg; that is, a pair of trousers. The advantages of this costume were apparent to the laboring classes, who soon exchanged their kiltlike garment for the serviceable pantaloons.

Meanwhile, on the European shore of the Mediterranean Sea, a Greek civilization was developing. In early Greece, trousers never became popular; the earliest dress of the men consisted of a square piece of cloth, open on one side, and known as the *himation,* while in later times the *chiton,* a close-fitting, sleeveless shirt, reaching below the knees, was worn under the himation. The women wore a loose chiton of fine linen, reaching to the feet, and confined below the bust by a girdle. Sometimes they draped over the chiton a woolen shawl, called a *peplos.* The Romans, who imitated the Greeks in dress as well as in art, literature and mythology, had as their characteristic garment the *toga,* a sort of loose cloak under which was worn the *tunic* (see Toga; Tunic).

GREEK CHITON

As the Romans began their invasions northward it became necessary for their fighting men to adopt a costume appropriate for warfare, and so their soldiers wore, in addition to the tunic, tight-fitting trousers reaching to the calf of the leg. This garb was a copy of the

ANCIENT ROMAN DRESS
From left to right: Citizen, statesman, tribune.

dress worn by the Phoenicians, an Oriental people whose trading ships were found in the ports of all nations. When Julius Caesar invaded the island of Britain (England) in 55 B. C. he found the natives wearing a close, tuniclike coat and short pantaloons, in imitation of the Phoenician merchants who had visited their shores.

The conquering Romans who came in contact with the Teutonic tribes of Central Europe found the men wearing trousers, and the women a long robe similar to the costume of the Greeks. From these two types—trousers and skirts—has come the standard dress of modern Europeans and Americans. Man's attire of the present time, however, the cutaway or sack coat for business wear, and the black long-tailed coat and low-cut vest for evening, is far removed from the rich and elaborate costumes worn in the Middle Ages and the early modern period. Oriental love of brilliant colors and ornamentation, first making its influence felt in Eastern Europe, spread later to the nations of the West, and by the beginning of the fifteenth century the costumes of both men and women had become so elaborate as to be burdensome.

During the Renaissance the characteristic dress of the man of fashion was the doublet, hose and cape. The stockings reached from waist to toe; the doublet, forerunner of the modern waistcoat, was a close-fitting garment, with or without sleeves, which reached from the neck to the waist; the cape, a relic of the ancient flowing robe, hung across the back and served chiefly for ornament. In England, dur-

ing the reign of Queen Elizabeth, both men and women of fashion wore a stiffly-starched collar reaching from shoulder to ear—the ruff of time-honored fame. A gentleman at the court of Queen Bess was a much-padded man: his sleeves were puffed out until no one could tell the shape of his arms; his hose were padded from thigh to knee; and his doublet was likewise generously stuffed. The whole suit was made of rich satins and velvets of many different colors. By the time of King Charles I court gentlemen were wearing short breeches, foppishly trimmed with fringe and ribbons of many hues.

DOUBLET, HOSE AND CAPE

Correct dress of the English nobleman of the Elizabethan period.

The modern tendency toward simplicity in men's dress dates from the close of the French Revolution, late in the eighteenth century. Men began to discard the powdered wig for their own hair, which they wore short and with its natural color, and the knee breeches became the modern trousers, reaching from waist to ankle. Women's dress has undergone striking changes in detail, but it has retained many of the decorative features now discarded by the men (see FASHION). The interest that the modern woman takes in athletics and out-of-door sports has helped to bring about wholesome changes in the matter of dress (see subhead below).

OTHER ELIZABETHAN COSTUMES

Woman in court costume and rich merchant of London.

It is characteristic of modern races that they wear many more garments than did the ancients. Stockings and underwear are almost wholly of modern origin, and it is believed that the custom of wearing hats was very little practiced by the nations of antiquity. Sandals were used generally in ancient times as a covering for the feet, but a form of footwear similar to the modern boot was known to the Egyptians, Greeks and Romans (see BOOTS AND SHOES).

Dress Reform. Woman's dress in modern times has called forth severe criticism because of features that violate the principles of hygiene. These criticisms have been directed chiefly against high heels that promote an unhealthful and unnatural carriage, tight stays that restrict the breathing capacity and injure

GREEK SANDALS

the internal organs, and long skirts which collect dirt and disease-producing germs. In the United States, about the middle of the nineteenth century, a movement for a more rational dress for women began to take form, and a National Dress Association was organized to carry on the work of popularizing hygienic clothing. About two decades later a similar movement originated in England under the name of the Rational Dress Movement.

The most notable of the early American crusaders was Mrs. Amelia Bloomer, whose name is perpetuated in the loose Turkish trousers which she advocated as the most sensible dress for women. The "bloomer" costume is now worn chiefly in the gymnasium, though a few courageous women adopted it for use while riding the bicycle, when that vehicle was at the height of its popularity. The participation of women in out-of-door sports has been one of the most important factors in the hygienic dress movement. Girls who play tennis and golf must don clothing which permits free and

unhampered bodily movements, and they have helped to popularize comfortable shoes and short skirts.

There will always be those who choose to dress as the extremes of fashion dictate, regardless of the laws of hygiene. The rational dress movement, however, has accomplished much. Common sense in the matter of dress has ceased to be an oddity, and any woman may wear clothes that are comfortable and hygienic without being singled out for ridicule or pity. Even Dame Fashion has yielded to the outcry against the restricting stays, and it is inconceivable that there will ever be a return to the "hour-glass" shape that was but a few years ago the accepted ideal for a woman's figure. See FASHION. B.M.W.

Related Subjects. The following articles in these volumes contain much information as to various fabrics from which clothing is made and as to certain specific articles of dress:

Boots and Shoes	Felt	Plush
Broadcloth	Flannel	Ribbon
Brocade	Flax	Satin
Button	Fur and Fur Trade	Shoddy
Calico and Calico Printing	Gingham	Silk
Cambric	Glove	Stola
Chiffon	Gold Lace	Taffeta
Cloth	Hat	Tartan
Corduroy	Hemp	Tunic
Costume	Lace	Turban
Cotton	Leather	Tweeds
Crape	Linen	Velvet
Crinoline	Mohair	Wool
Dimity	Muslin	Worsted

DREW, JOHN (1853-), an American actor whose successes have been in light comedy rôles in plays gently ridiculing society. He is the son of the Irish comedian, John Drew, Sr., and the actress Louisa Drew, and made his first appearance in his mother's theater in Philadelphia. Three years later he took various parts in New York under Edwin Booth, Fanny Davenport and other stars. For years, beginning in 1875, he was the leading comedian in Daly's company, winning great popularity as Petruchio in *The Taming of the Shrew,* and as Charles Surface in *A School for Scandal.* After 1892 Mr. Drew was a star, appearing in *The Butterflies, A Marriage of Convenience, The Liars, Richard Carvel, The Tyranny of Tears, The Will, Rosemary, The Prodigal Husband* and other plays. For many years he was under the management of Charles Frohman, but in 1916, after the death of Mr. Frohman, he came under the management of John D. Williams. During the season of 1916-1917 he acted, with high distinction, the part of Major Pendennis in a dramatization of Thackeray's popular novel.

John Drew is the uncle of the well-known actors, Lionel, John and Ethel Barrymore (see BARRYMORE). His daughter, Louise Drew, is also a talented stage personage.

DREX'EL INSTITUTE OF ART, SCIENCE AND INDUSTRY, a school founded at Philadelphia, Pa., in 1891, by Anthony J. Drexel (see below) for the industrial training of men and women. The institution is divided into three departments, the engineering school, the school of domestic science and arts, and the secretarial school. Of these, the first is for men and the second for women; in the third both men and women are trained for positions as secretaries. There are special courses also in chemistry, architecture and English; both day and night classes are maintained, and the work is supplemented by free public lectures and concerts. The museum of Drexel Institute contains valuable examples of decorative art and collections of textiles. The entrance requirement is graduation from a high school or its equivalent, and the fees are very moderate. Nearly 3,000 are enrolled yearly in all departments. An important feature of the school is a splendid library of over 40,000 volumes.

Anthony Joseph Drexel (1826-1893), whose generous gift of over $2,000,000 made possible the establishment of Drexel Institute, was born in Philadelphia. At the age of twelve he entered the banking house of Drexel & Company, founded by his father, became a member of the firm eight years later, and in 1885 was nominally the head of that great banking system, with branches in New York and Paris. In 1864 he joined with his friend George W. Childs (which see) in the purchase of the Philadelphia *Public Ledger,* and was also associated with the latter in the founding of the Childs-Drexel Home for Union Printers at Colorado Springs, Colo. At his death his fortune was estimated to be about $30,000,000.

DREYFUS, *dra'fus,* ALFRED (1859-), a French soldier of Jewish descent, the victim of a racial and military plot which stirred the world. He was born in Alsace, entered the army in 1882, and showed such marked ability that he was appointed to the general staff in 1891. Three years later he was arrested on a charge of selling information to Germany. His trial resulted in his dismissal from the army, public degradation and transportation to Devil's Island, off the coast of French Guiana,

a French penal colony. In answer to popular demand the prisoner was retried in 1899. The feeling in the army against Jews was so bitter that the second trial was practically a mockery, and Dreyfus was again declared guilty, "with extenuating circumstances." The public was not satisfied with the evidence or the manner in which the trials had been conducted. In 1899, a few months after his second conviction, he was pardoned by President Loubet.

Emile Zola, the novelist, was among those who strongly supported his cause, and his complete vindication was obtained in 1906. It was conclusively proved that Dreyfus had been the victim of a conspiracy, and had been condemned on forged evidence. He was given the more advanced rank of major and enrolled in the Legion of Honor. While witnessing the removal of Zola's body, Dreyfus was wounded by a fanatic, who was liberated, however, on declaring that he had fired the shot only as a "demonstration." At the outbreak of the War of the Nations, in 1914, Major Dreyfus was placed in command of one of the forts protecting Paris.

DRIFT, in geology, is the name applied to deposits of rock and earth that were carried to their present position by ice and left there when the ice melted. Drift was formed during the Glacial Period. It varies in thickness, and contains whatever the glacier gathered on its surface during its course down the slope where it grounded. Large rocks in the form of boulders, differing in character from the rock in the locality, are occasionally found; these were brought to their present localities by a glacier. In some places the ground is covered with small boulders mingled with gravel, and in other places there are masses of broken rock, some of which may be deeply scratched. All these formations are drift. See GEOLOGY; GLACIAL PERIOD; GLACIER.

DROMEDARY, *drum'e da ri,* a lightly-built, fleet-footed, single-humped camel used for travel in various parts of India, Arabia and Africa. This enduring animal of the deserts can live on a very small amount of food and water, and requires only short periods of rest. It can travel at the rate of nine miles an hour for many hours, and can cover six hundred miles in five days. Its swinging trot, like the gait of a pacing horse, jolts less than the gait of an ordinary camel, but it is nevertheless hard on the rider. The general characteristics of the dromedary, or Arabian camel, are outlined in the article CAMEL.

DROPSY, *drop'si,* a disease whose name is the modern form of the word *hydropsy,* derived from the Greek *hydor,* meaning *water.* It is not applied to any particular malady, but to a symptom which accompanies several diseases. In dropsy there is an excess of fluid in the tissues, causing swelling. This fluid is derived from the blood. The presence of dropsy may be recognized by the small pit remaining after a finger is pressed upon the swollen part. It is sometimes necessary, when other remedies have failed, to remove the accumulation of fluid by means of a drainage tube inserted in the cavity or beneath the skin. This can be done without danger in most cases, under the direction of a skilled physician. Dropsy may be general, or it may be localized, having as its site the brain, the heart, etc. W.A.E.

DROWNING, *droun'ing,* death caused by suffocation in water or other liquid. From the earliest times until the beginning of the seventeenth century drowning was a common form of capital punishment in Great Britain and most European countries. Feudal lords who held power of life and death over their subjects or retainers were authorized to inflict the death penalty "by ditch or by gallows." In some cases the victim was given his choice of hanging or drowning. What was considered the more honorable death by drowning was usually chosen, a fact that may have given rise to the widespread belief that drowning presents the least unpleasant form of death. The death penalty was inflicted for trivial offenses in Great Britain until the commencement of the eighteenth century, but the practice of drowning criminals was abolished earlier. In Scotland a man was drowned, in 1611, for stealing a lamb. The early laws of Burgundy condemned a faithless wife to be smothered in mud. Drowning as a capital punishment is now practiced only in Mohammedan countries and in the Far East.

A person falling, or being thrown, into the water and unable to swim would probably lose consciousness in a minute, or in two minutes, at most. If the shock of immersion produces insensibility, death does not usually occur until after a longer interval than if the drowning person struggled violently—probably from two to five minutes after immersion. The popular belief that a drowning person must come to the surface three times before finally sinking is a fallacy. He may not rise at all, his doing so depending on circumstances, especially on the position of the arms during his struggles.

If they are held above the head, the body sinks deeper in the water. If they are held down at the sides, the body will probably rise to the

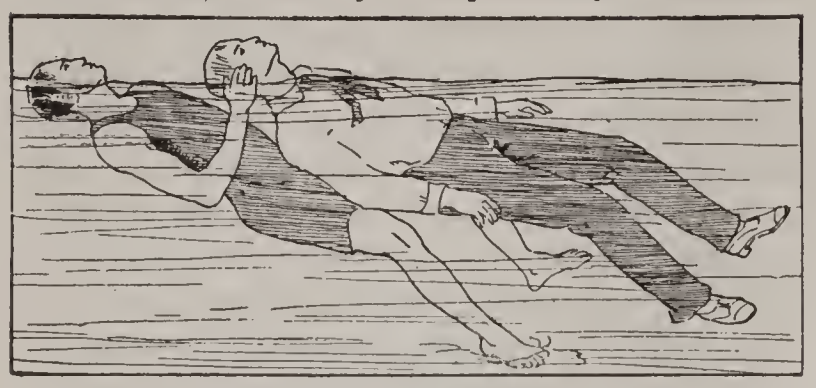


FIG. 1

surface. The tendency of all drowning persons to "clutch at a straw," or to take hold of anything within reach, only increases their difficulty and danger. The same habit often renders useless the efforts of rescuers.

Methods of Rescue. If the rescuer is in a boat his task is greatly simplified. The drowning person must be seized and lifted into the boat and conveyed as quickly as possible to the shore. If, however, the rescuer is swimming, he must be wary in his approach. If not prevented, the drowning person may grasp him round neck or waist and endanger the lives of both. What appear to be harsh measures are sometimes necessary to break the hold of a drowning person. Should the rescuer

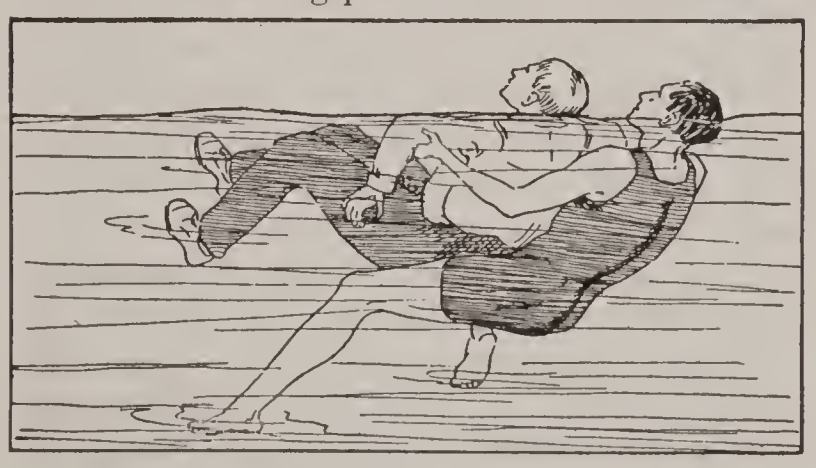


FIG. 2

be grasped round the neck, he must place one hand against the back of the drowning person and with the other pinch his nostrils while forcing his head back. The drowning person will immediately let go his hold. If clutched round the body, the rescuer must quickly adopt strong measures by placing his knee against the stomach of the drowning person and then throwing the whole weight of his body backward. This will effect his release.

If the drowning person is conscious and sufficiently calm he should be grasped by the hand and turned on his back. The rescuer then swims on his back with the body of the drowning person above him, taking care to keep the man's face above water (Fig. 1). A struggling person should be firmly held by the arms, just above the elbows, the rescuer then turning him on his back (Fig. 2). Sometimes the struggles may be so violent that the rescuer has difficulty in securing either of the holds mentioned. He should then slip his hands under the armpits, raising the drowning person's arms to right angles with his body (Fig. 3). He is then helpless and the rescuer may swim with him to shore. When entering the water from a high bank or bridge to effect a rescue it is always advisable to drop in feet first unless the depth of the water is accurately known.

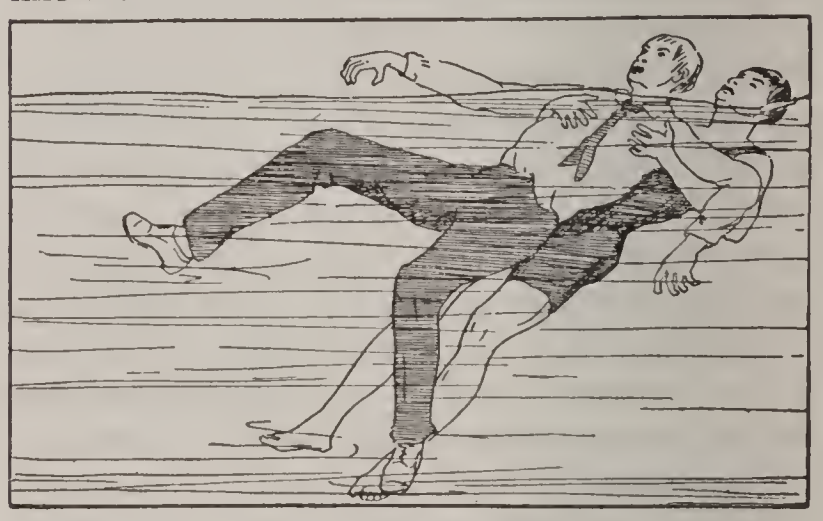


FIG. 3

First Aid Measures. It is an undoubted fact that many lives are lost through ignorance on the part of the rescuers as to the best method to adopt when the drowning person has been safely removed from the water. The simplest and most efficient method of revival is as follows: Place the body face downward on the ground with the arms extended as shown in the illustration (Fig. 4). The rescuer should then kneel with one knee on either side of the body, placing his two hands flat on the lower part of the back and pressing on the lowest ribs. The weight of his body should then be thrown forward, pressing the ribs upward. This

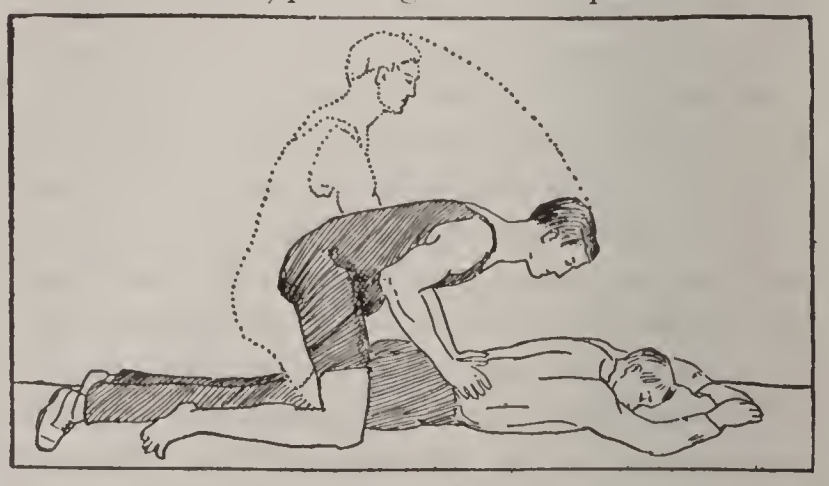


FIG. 4

will drive air and water out of the patient's lungs.

The rescuer then slowly raises his body, releasing the pressure. These operations should

be repeated thirteen or fourteen times a minute and should be continued for at least half an hour, if not more quickly successful. If assistance is available, hot water bottles and hot flannels should be applied to feet and body, but the alternate pressure on and release of the lowest ribs must be maintained without any attempt to change clothes or give any medicine or restoratives until the patient has commenced to breathe naturally. By this method persons have been revived when it seemed impossible that there should be even a lingering spark of life.

Though some such mechanical device as the pulmotor (which see) has been used to advantage in reviving unconscious persons, the weak point in depending upon such apparatus lies in the fact that it is not usually at hand. If more than ten minutes elapse after breathing stops, nothing can usually be done to revive the victim. A well-known authority says: "Universal training in the manual method will accomplish more for resuscitation than is possible by providing any amount of apparatus." F.ST.A.

DRUG'GIST, or **PHARMACIST,** *far'ma sist,* a person who has made a study of drugs and medicines, taken an examination and received a license to prepare and sell medicines and fill doctors' prescriptions. In the United States and Canada, *druggist, pharmacist* and *apothecary* have the same popular meaning, but the term *druggist* is in most common use, just as *drug store* is applied more often than *pharmacy* or *apothecary shop* to the place where medicines are prepared and sold and prescriptions are filled. *Pharmacy,* from a Greek word meaning *the use of medicine,* is the science and art of preparing and preserving drugs and medicines. Correctly speaking, a pharmacy is a shop where only drugs are compounded and which does not offer for sale the usual array of articles displayed in drug stores.

Schools of pharmacy have existed in the United States since 1821, and the leading universities have departments for teaching this branch of medicine, but each state makes its own laws as to the qualifications its druggists must possess. All of the leading universities of Canada have schools of pharmacy connected with them, and the Ontario College of Pharmacy is an important institution of Toronto.

DRUIDS, *droo'idz.* Long ago when the Britons lived in England they had priests who were called druids. These druids lived in huts or caverns in the forest and were thought to be very wise. There were no temples in which the people could worship, but at noon or at midnight they went to a grove of oaks, where the Deity was supposed to be present, and offered their prayers. The druids worshiped the same gods as the Greeks and Romans, but called them by different names, and they also believed in an after-life.

The druids were held in very great respect and honor, because they were so wise. They taught the children and tried to keep peace among the people, who would do almost anything a druid would tell them to do. Many years were spent in preparation to be a druid, and only sons of illustrious families were allowed to enter the schools for training. They were sworn to secrecy, as they were supposed to possess a mysterious science, but their knowledge was mainly about the stars and simple medicines. Besides acting as teachers, they were prophets and judges, so people often called on them to settle public or private disputes.

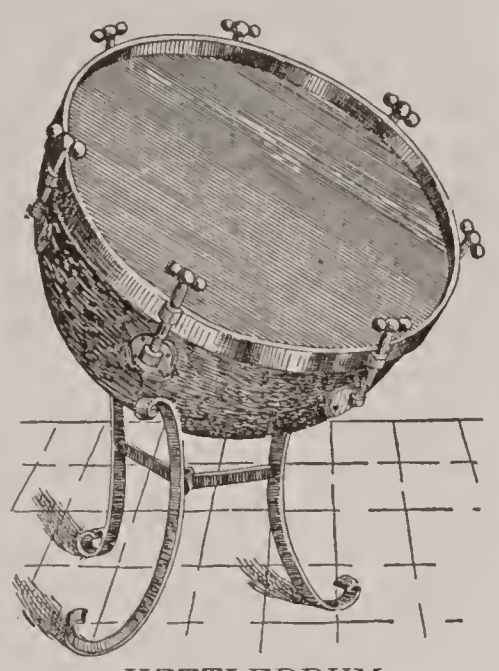
DRUM. There are scholars who say that men talked in poetry before they learned to speak in prose, but whether this be true or not, it is certain that with primitive man rhythm is an instinct. That is why the drum is the oldest of musical instruments. Go anywhere among races still in their childhood and one is almost certain to find the tom-tom marking the beat of the native dances, just as the more intricately-fashioned drum emphasizes the rhythm in the ballrooms of the civilized world.

Bass Drum, or **Turkish Drum,** formerly known as *long drum,* is the big, heavy instrument whose deep full tone or dull thud marks the climaxes in orchestral music and emphasizes the rhythm in music of large bands and orchestras. It has a short, hollow cylinder of wide diameter, both ends being covered with tightly stretched skin or vellum, kept in place by hoops. These can be adjusted by means of leather braces which can be slipped up or down on zig-zag cords that pass around the cylinder and connect the hoops. Adjustment by means of these braces, or by various rods and screws, will vary the pitch of the drum. The bass drum is played by beating on one or both sides with a stick having a large knob covered with cork, sponge or felt.

Snare Drum, or **Side Drum,** is the drum of resonant tone, and the drum which plays such an important part in military life. This little

instrument, with the rattling, rumbling voice, consists of a hollow brass or wooden cylinder and is constructed like the bass drum, excepting that catgut strings, or *snares,* are stretched across the lower end, or *head,* to produce the brilliancy of sound lacking in drums without snares. This drum is sometimes worn at the side; it is played with two slender, wooden sticks. Skilful playing of the snare drum is really difficult and very interesting.

Kettledrum, a hollow hemisphere of brass or copper, the end of which is covered with vellum, which is adjusted by means of screws. It is played with a felt- or leather-covered mallet. The kettledrums are generally used in pairs in orchestras, one being tuned to the keynote, and the other to a higher key. Sometimes three are used. They are the only drums which can be accurately tuned.



KETTLEDRUM

Beethoven was the first to recognize the possibilities of a drum in orchestral performances. C.H.H.

DRUM'MOND, Sir George Gordon (1772-1854), a British soldier, second in command of the British forces in America from 1813 to 1815. He was born in Quebec, entered the British army when a boy of seventeen, and distinguished himself in Egypt and during the Napoleonic wars in Europe. From 1808 to 1811 he was on duty in Canada, and in 1813 was again sent there as second in command to Sir George Prevost. He personally planned the successful attacks on Fort Niagara and Oswego, and was in command of the British forces at the Battle of Lundy's Lane, occurring on July 25, 1814. After the recall of Sir George Prevost, Drummond remained in Canada as commander-in-chief until 1816.

DRUMMOND, Henry (1851-1897), a well-known Scottish evangelist, scientist and author. His fame rests upon his attempt to explain the theory of evolution in connection with Christianity in his two famous books, *Natural Law in the Spiritual World* and *The Ascent of Man.* He was born at Stirling and after graduating from the University of Edinburgh in 1870 began to study for the ministry at New College, Edinburgh. Stirred by the evangelistic work of the Americans, Moody and Sankey, he began mission work, and the religious movement which he started spread throughout England and even to America and Australia. In 1877 he was appointed lecturer on natural science in the Free Church College, Glasgow; in 1884 he became professor of theology there, and his religious work among the students became a great power.

He traveled extensively, making three trips to the United States and Canada and one to South Africa in the interest of science. On his visits to America he lectured on both religious and scientific subjects. *Travel Sketches* and *Tropical Africa* were written after these trips. His first book, *Natural Law in the Spiritual World,* created a decided sensation, requiring twenty-nine editions in ten years. Perhaps his greatest work was his short analysis of the thirteenth chapter of *I Corinthians,* called *The Greatest Thing in the World.*

DRUMMOND, William Henry (1854-1907), a Canadian physician and poet, whose dialect poems about the *habitants* won for him a unique place in Canadian literature. Drummond was born in County Leitrim, Ireland, but when still a boy he came to Canada. He attended high school and McGill University at Montreal, and in 1844 was graduated in medicine from the University of Bishop's College, Lennoxville, Quebec. He was fond of sports and was naturally athletic, being an expert shot-putter and hammer-thrower, a skilful angler and a good shot. With this equipment, in addition to his medical knowledge, it was natural that he would have a sympathetic insight into the lives of people like the *habitants,* the lumbermen and fishermen, the Indians and half-breeds, who were steeped in the lore of forest and river.

WILLIAM HENRY DRUMMOND

Dr. Drummond began his professional career in a community made up chiefly of French-Canadian *habitants* and half-breeds, with a considerable sprinkling of English and Scotch-Irish, and even in later years, when he was practicing in Montreal and was a distinguished

professor of medical jurisprudence in the University of Bishop's College, he never lost his sympathy for these people. He put their stories and their lives into verse, in a broken English which greatly heightens the humor and the pathos. Among the best of these poems are *The Habitant; The Last Portage; The Wreck of the Julie Planté; Leetle Bateese; Johnnie Courteau,* and *The Voyageur.*

Several volumes of his poems were issued during Drummond's life, and in 1912 they were edited by Louis Fréchette. G.H.L.

DRUM'MONDVILLE, the county town of Drummond County, Quebec, sixty-two miles northeast of Montreal and twenty-eight miles northeast of Saint Hyacinthe, on the Saint Francis River and on the Canadian Pacific and Intercolonial railways. Drummondville is a manufacturing center, its largest establishment being a chemical works, with 800 employees. Other large establishments make boots and shoes, steel and structural iron, foundry products, lumber and various wood products, including sashes, doors, matches and carriages. The Saint Francis River is not navigable, but supplies water power at Lord's Falls, near the town. Population in 1911, 1,725; in 1921, 2,852.

DRYADS, *dri'adz,* or **HAMADRYADS,** *ham'a dri adz,* in classical mythology, the wood nymphs who danced with the god Pan. It was believed that with each tree a dryad came into existence and that she, too, perished when the tree died. Purposely to destroy a tree, the house of a dryad, was considered an impious act and was punished accordingly. These graceful nymphs of the woodlands at times assumed the forms of followers of the hunt, peasant girls or shepherdesses. See NYMPHS.

DRYDEN, *dri'den,* JOHN (1631-1700), a distinguished English poet, dramatist and critic, the greatest writer of the last two decades of the seventeenth century. He was the first poet of the new school whose typical representative was Alexander Pope, and he was also one of the earliest masters of English prose. Dryden, the third son of a baronet, was born in Aldwinkle, a village of Northamptonshire. He studied at Westminster School and at Trinity College, Cambridge, receiving his degree of B. A. at the latter institution in 1654. In 1658, the year after his removal to London, he published his first important poem, *Heroic Stanzas to the Memory of Oliver Cromwell.*

Though a loyal adherent of Cromwell, Dryden shared the nation's joy over the restoration of Charles II (1660), celebrating that historical event in two dignified poems entitled *Astraea Redux* ("The Return of the Heaven-born") and *Panegyric on the Coronation.* In 1663 the performance of the *Wild Gallant,* at the King's Theater, proclaimed him a dramatist and marked the beginning of a series of tragedies and comedies that covered the next twenty years of his literary career. Of these, the best is *All for Love,* a tragedy written in blank verse and founded on Shakespeare's *Antony and Cleopatra.* His other tragedies, which are of the type known as the "heroic" play, are written in a form of verse in which the lines rhyme in couplets. In the heroic play there is no attempt to portray real life. The themes are lofty, almost operatic in character, and the work has something of the effect of an epic poem. Of this form of dramatic writing Dryden was the great master. His plays, however, reflect the low moral tone of his age (see DRAMA).

JOHN DRYDEN

In 1667 he produced the best of his earlier poems, *Annus Mirabilis* ("The Wonderful Year"), his theme being the successful war with the Dutch and the great London fire of 1666. In 1670 his talents received royal recognition in his appointment as poet laureate (which see). Though he was then in the high tide of a successful literary career, his dramas were held up to scorn in a play called *The Rehearsal,* written in 1671 by the Duke of Buckingham. Dryden obtained his revenge when he wrote his celebrated political satire in verse, *Absalom and Achitophel* (1681). In this he struck hard at all of his enemies, including the Duke, and ably defended Charles II against the Whigs. In 1682 he published *The Medall,* a satire on the notorious Earl of Shaftesbury; *MacFlecknoe,* a scathing attack on a minor contemporary poet, Thomas Shadwell, and the second part of *Absalom and Achitophel.* In the same year appeared his *Religio Laici,* a poem defending the doctrines of the Church of England.

Dryden's conversion to the Roman Catholic

faith was made known in 1687 by the publication of his *Hind and Panther,* a long poem giving a supposed dialogue between a milk-white Hind, typifying the Catholic Church, and a spotted Panther, representing the Church of England. On the accession of the Protestant monarchs, William and Mary, he lost his office of poet laureate, and the last years of his career were devoted mainly to translations or renderings of Vergil, Ovid, Boccaccio and Chaucer. In 1687 he wrote the first of his *Songs for Saint Cecilia's Day,* and in 1697 the second of the lyrics was published as an ode on *Alexander's Feast,* the concluding lines of which are:

> At last divine Cecilia came,
> Inventress of the vocal frame;
> The sweet enthusiast, from her sacred store,
> Enlarged the former narrow bounds,
> And added length to solemn sounds,
> With Nature's mother-wit, and arts unknown before.
> Let old Timotheus yield the prize,
> Or both divide the crown;
> He raised a mortal to the skies,
> She drew an angel down.

Dryden's greatness as a poet rests chiefly on his mastery of verse form. He lacked the fire and imaginative power of the writers of the Shakespearean era, and his fame and popularity as a poet suffered a permanent decline when the splendid outburst of the Romantic Period revealed the possibilities of the poetry of inspiration and imagination (see ROMANTICISM; WORDSWORTH, WILLIAM). As a critic, however, and as the creator of an easy, graceful and correct prose style, his fame is secure, and his *Essay on Dramatic Poesy,* setting forth his views on the rhymed couplet in tragedy, is a masterpiece of criticism. B.M.W.

DRY FARMING, or crop raising without irrigation on lands which receive little rainfall, has within recent years become so effective that hundreds of thousands of acres once considered half-desert are now fertile farms. In general, if less than twenty inches of rain fall on a piece of land within a year, dry-farming methods are necessary; if less than ten inches, irrigation alone makes the tract valuable.

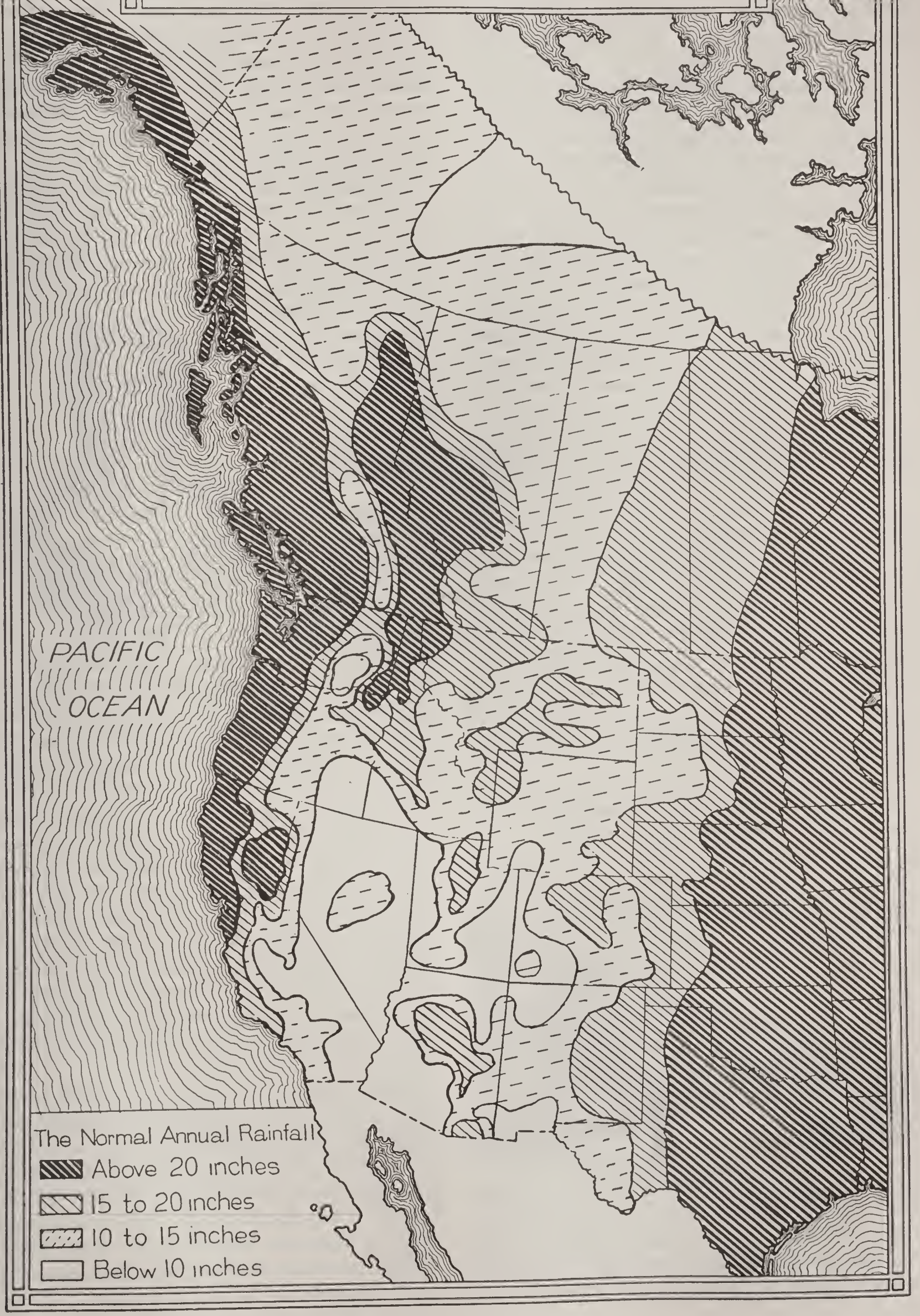
The success of dry farming depends upon storing in the ground the moisture which it receives. The methods chosen vary with the conditions in each locality, such as the total amount of rain, the seasons in which it falls, its frequency and the rapidity of evaporation and of drainage. Thus on the Canadian prairies, where most of the moisture falls in summer, dry farming is conducted differently than in Oregon, which has winter rain. So, too, when rain falls in frequent light showers it has a different effect from rain coming in violent storms. Besides, the variations in evaporation are so great that fifteen inches of rainfall in Saskatchewan are more than the equivalent of twenty-one inches in Texas.

Canadian Methods. Farmers who settle upon the prairies of Manitoba, Saskatchewan and Alberta from Eastern Canada or other regions of plentiful rain frequently insist upon treating their land as they had done in their older homes. They usually fail. But those who follow the dry-farming instructions which the Dominion experiment stations have given since 1888 raise larger crops of wheat than are known in the United States, and have success with other crops.

Breaking and *backsetting* and *summer-fallowing* are the processes recommended. If a farmer raises a crop on new land the first year, he will fail to secure a crop the next year, because he will have exhausted the moisture in the soil. So the best plan is to seed only a part of the farm. On the rest the prairie sod is plowed, or *broken,* as shallowly as possible, before the rains of early summer, which will then rot the sod. Early in August the sod is *backset,* or turned back to its original place, with two or three inches of fresh soil over it. It is then broken into powder with a disk-harrow, an implement described in the article HARROW. The moisture preserved in soil prepared in this fashion will be sufficient for a crop the next year. When this is cut, a high *stubble* (the stumps of the grain stalks) should be left to hold the snow, which will melt in the spring and give the moisture necessary to germinate the seed. At seeding time the stubble may be plowed under or burned. After the second crop the land should be *summer-fallowed,* that is, left idle after being plowed seven or eight inches deep in time to catch the summer rains. Otherwise, except in a year of unusual rainfall, the next crop will suffer from drought. It is especially important in dry farming to keep down the weeds, for they rob the soil of water.

In the United States. Interest in scientific dry farming in the United States commenced just before the end of the last century, when several years of slight rainfall had caused immense crop loss in the West. Summer-fallowing, where it is found helpful, is usually practiced in alternate years instead of every third

DRY-FARMING AREAS



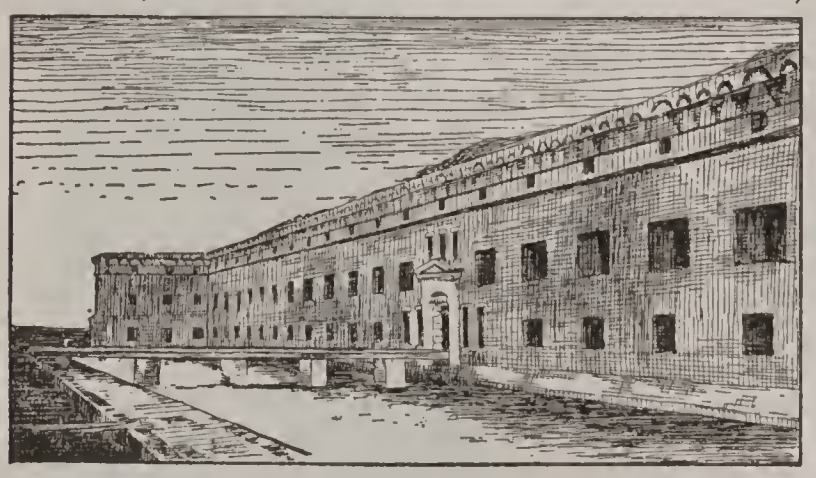
year, as in Canada, and is especially suitable to regions of winter rain. In Utah and a large part of the Great Basin, where rain falls in both spring and winter, wheat is sown in the fall and remains in the ground through the winter, sprouting early and maturing before the dry winds of the summer. The resulting crop is known as *winter wheat*. On the Great Plains, on the other hand, the rain comes in the summer in showers so light that the moisture would evaporate before it could be absorbed by summer fallow. In this case the best method seems to be to plow deep before the spring sowing, and to harrow the ground after the grain is high enough to shade the ground and prevent evaporation.

Further progress has been made in agriculture in the semi-arid regions by a study of the comparative resistance of different crops to drought. Besides wheat, success is found with rye, oats, flax, barley, corn, potatoes, sorghum, alfalfa, many types of peas and beans, and, in the Southwest, with dates and olives. Though the methods for each crop are different from that for the wheat farming described above, the principles are the same.

Dry-Farming Congresses. Since 1907 there has been an annual convention of American and Canadian farmers in the West, the object of which is to advance the science of dry farming. Prizes are given each year for the best exhibits of agricultural products raised by dry-farming methods. The winners for wheat and oats are most often from Saskatchewan or Alberta. C.H.H.

Consult Shaw's *Dry Land Farming;* Widtsoe's *Dry Farming: A System of Agriculture for Countries Under a Low Rainfall.*

DRY TORTUGAS, *tawr too' gas,* a group of ten low, coral islets off the coast of Florida,



ON DRY TORTUGAS
Old Spanish fort, the most southerly building on United States territory.

almost directly west of Key West, set aside by the United States government as a permanent reservation for wild birds. They are situated in the Gulf of Mexico, about 120 miles southwest of the southern extremity of Florida, and are politically attached to Monroe County, of that state. Fort Jefferson, one of the islands, contains a fort which was used as a penal station during the War of Secession. On Loggerhead Key, the largest of the group, is a lighthouse, and in 1904 the Carnegie Institution established there a laboratory for the study of marine biology. See BIRD, subtitle *Government Protection of Birds.*

DU BARRY, *dü ba re',* MARIE JEANNE BÉCU, Countess (1743-1793), the charming, extravagant mistress of Louis XV who succeeded Madame de Pompadour. She was the daughter of a poor woman, but her beauty won her friends, through one of whom she was placed in a convent, where she remained about eight years. She then held positions as lady's maid and milliner, finally becoming the mistress of Comte Jean du Barry. Presiding over her lover's gaming rooms, she met King Louis XV, who became infatuated with her, and about 1769 he married her to the brother of Comte Jean du Barry, so that she might be brought to court. Until the death of Louis she was the real ruler of the country, for the most important policies of the government were decided by her. Her quick wit, gracious manners and alluring beauty brought her admirers, but she had many enemies as well. After the death of Louis XV she was banished from court, and during the Revolution, through the influence of Robespierre, she was tried and executed for having wasted the public wealth, for conspiracy against the republic and for mourning for King Louis.

MADAME DU BARRY

David Belasco's successful production *Du Barry,* in which Mrs. Leslie Carter starred, was featured in moving pictures.

DUB'LIN, the capital and ancient seat of the government of Ireland, situated at the mouth of the River Liffey. The river divides the city into two almost equal parts and is crossed by twelve bridges, the finest of which is a magnificent structure named after the

patriot O'Connell. The older portion of the city has narrow, dirty streets, but the more modern parts are well built and contain many fine thoroughfares. Sackville Street is one of the broadest streets in the British Isles, with a width of 120 feet. The banks of the Liffey are lined with well-built granite docks for a distance of two miles from the sea, and ships drawing twenty-three feet of water can enter at low water.

The castle, the official residence of the viceroy, is an imposing building, and there are many fine modern buildings in the business section of the city. The old home of the Irish Parliament is now the Bank of Ireland, but will in all probability again become the seat of an Irish legislature (see HOME RULE). Dublin is noted for its squares, and in Phoenix Park possesses one of the most beautiful parks in Europe. Although not a manufacturing center, the city has important industries and carries on an extensive trade. Stout and whiskey are the principal products, but a large quantity of the celebrated Irish poplin is manufactured. Swift, Steele and Sheridan were all natives of Dublin, and were buried in the beautiful cemetery of Glasnevin, on the banks of the Liffey. There also lie the remains of Charles Parnell, for many years leader of the Irish political party in the British Parliament.

Dublin is a city of great age; it was a place of importance before the Christian Era. The Danes captured it in the ninth century and held it until driven out by Henry II (1133-1189). Population in 1911, 403,030.

Dublin University, the foremost, and for centuries the only, university in Ireland. It is generally known as Trinity College, being both college and university. First established in 1320, it was abandoned for want of support. In 1591 it was incorporated as the "College of the Holy and Undivided Trinity." Entrance to its classes is obtained by examination, and degrees are conferred on all graduate students.

DU BOIS, *doo bois'*, PA., a borough in Clearfield County, west of the center of the state, 129 miles northeast of Pittsburgh. It is on the Buffalo & Susquehanna, the Buffalo, Rochester & Pittsburgh and the New York Central railroads, and is also served by electric interurban lines. Coal mining is the leading industry, and the borough also contains glass and clay works, blast furnaces, refining works, extensive railroad repair and construction shops, a foundry, a tannery and an ice-cream factory. Du Bois was settled in 1873 and was incorporated as a borough in 1881. It has a general hospital. In 1910 the population was 12,623; in 1920 it was 13,681. The area is about three square miles.

DUBUQUE, *doo buque'*, IOWA, popularly called the *Key City,* the oldest city of the state and the county seat of Dubuque County, is situated in the northeastern part of the state, on the Mississippi River. Chicago is 172 miles slightly southeast, Des Moines, the state capital, is 206 miles southwest, Saint Paul is 252 miles north and Omaha is 337 miles southwest. By water, Clinton is eighty miles south. Transportation is provided by the Illinois Central, constructed to the city in 1859; the Chicago, Milwaukee & Saint Paul, built to this point in 1875; the Chicago Great Western (1884), and the Chicago, Burlington & Quincy (1886). The city is also a port of call for packet lines operating between Saint Louis and Saint Paul, but water transportation is not important. The river is spanned by three bridges, the north bridge touching the shores of Wisconsin. The population increased from 38,540 in 1910 to 39,141 in 1920.

Dubuque has a picturesque location within a crescent of bluffs about 300 feet above the river; at the foot of these bluffs lies the business district. Several cable roads and a winding street railway lead to the upper section of the city and to Eagle Point Park, a family resort of 120 acres at the northern end of the crescent.

Industry and Commerce. The city is the center of the lead and zinc region that extends into Iowa, Wisconsin and Illinois, and it contains extensive zinc works. Of its 130 industrial establishments the most noted is a manufactory where steel-hulled vessels, including government torpedoes, revenue cutters, transports, barges and many giant steamers of inland waterways, are built. Two of the largest sash and door factories in the world are located here, and another immense plant is devoted to the manufacture of cabinets. There are in addition important manufactories of agricultural implements, boots, shoes, lumber, wagons, carriages, flour, foundry products, malt liquors and pearl buttons; the machine shops of the Chicago, Milwaukee & Saint Paul Railway also operate here.

Institutions and Buildings. Since the population is largely Roman Catholic, the city has many Roman Catholic institutions of learning. About half the primary schools of the city are parochial schools. Columbia College is be-

yond doubt the leading Catholic School, but others are excellent. There are Wartburg Seminary (Lutheran), and the University of Dubuque (Presbyterian) and the Iowa Institute of Science and Arts among the notable schools. Mount Carmel (for girls) occupies a height overlooking the Mississippi, and is one of the show places of the city. Benevolent institutions include Mercy Hospital, Mercy Hospital for the Insane, Finley Hospital and the Y. W. C. A. Home. Dubuque is also the see of a Roman Catholic archbishop, and one of the two Trappist monasteries in the United States is in the vicinity. Besides the Federal building, constructed of Bedford stone about 1866, the city's notable buildings are the Carnegie-Stout Public Library, which cost $100,000, a $125,000 Elks' Home, completed in 1915, and the Hotel Julien Dubuque, also completed in 1915.

History. As early as 1788 Julien Dubuque, a French-Canadian trapper and miner, voyaged down the Mississippi River and discovered what became *The Mines of Spain,* under his grant from the Spanish governor of Louisiana. With several others he settled there for the purpose of mining lead. Upon his death (1810) the Indians buried Dubuque on a bluff overlooking the mines, and the legend is that fires were kept burning over his grave until they departed from the country after the Black Hawk War (1832). A monument of native stone erected by the Early Settlers' Association marks the grave. The settlement was abandoned after the death of Dubuque and was not again occupied until 1833. This was the first permanent settlement in Iowa. The city was incorporated in 1844.

DUCAT, *duk'at,* a coin first issued by Roger II of Sicily, Duke of Apulia, in the eleventh century, which later became common in all countries of Southern Europe. It was issued both in gold and silver and varied considerably in value. The silver coin was worth at various times the present equivalent of 75 cents to $1.10, while the gold coin was valued at $1.46, and sometimes as much as $2.32. The ducat of the Venetians, referred to by Shakespeare in *The Merchant of Venice,* had a standard value of $1.46. So Antonio's debt of 3,000 ducats to Shylock was close to $4,500, according to present standards. Austria still retains the ducat, valed at $2.285, but it is used more in foreign than in domestic trade.

DUCK, a web-footed water bird found both domesticated and wild throughout the world. Wild ducks are economically valuable as game birds, for the flesh of many species is highly esteemed as food. For that reason they are national assets, and as such are quite generally protected by laws. Even so, however, the ranks of wild ducks are being depleted yearly, and in some locations where myriads once bred and fed but a few hundreds now are seen. Only through careful conservation and coöperation of human beings can these birds keep their place in the scheme of the universe. Wastefully decreasing their numbers not only removes a valuable source of food and makes them a luxury for even the wealthiest, but also makes that interesting and healthful outdoor sport, duck hunting, almost a thing of bygone days.

General Characteristics. Ducks have broad, flat bills, tooth-edged, for holding or straining food. Their heads are large; the necks are rather long and slender, but much shorter than the necks of geese or swans, to which they are related. Their bodies are short and thick, covered with close, compact feathers, under which lies a thick, soft down. The feathers of many species are beautifully colored; all species keep their feathers well oiled from two large glands just above the tail, and so they are made waterproof. Ducks' legs are short, and are placed so far back it is difficult for them to walk; because of this their movements on land have been called a "waddle." Ducks are fine swimmers and wonderful divers. Their food consists chiefly of insects, snails, frogs and fish, as well as grains, grasses and other vegetable matter.

Mother ducks lay from six to sixteen eggs, in a warm nest made of leaves, hay and other

HOME OF THE MALLARD. The bird above was "shot" by the camera man as he rose from the water. Below, a scene during autumn migration

materials, lined with down from their breasts. The nests are placed usually on the ground near the water, sometimes in a bushy field farther back and in case of some species in a hollow tree. All the cares of the family fall upon the mother, although the father duck is a devoted lover. For four weeks she must remain on the nest almost continuously. Then, after the downy ducklings break through the shell, they are led by the mother to the water as soon as they can travel. For six weeks or more after hatching they are unable to fly, and she must guard them carefully, for snapping turtles, water-rats, snakes, pike and various hawks are dreaded enemies.

Wild Ducks. These birds can be divided into two classes, the *sea ducks,* which obtain their food by diving to great depths, and the *river ducks,* which breed in shallow water.

Sea Ducks. Species belonging to this class live not only in seas, but are also found inland. Unlike river ducks, they have a webbed hind toe, appear in large flocks and feed by day. Sea ducks are usually not so good to eat as river ducks, for most species feed on fish, lizards and tadpoles, which makes their flesh coarse and not agreeably flavored. The best-known species of sea duck, however, the *canvasback,* is highly valued for the table. It feeds chiefly on the bulbs of eelgrass, known as wild celery. It is that food which makes its flesh tender and gives to it the exceptional flavor which makes it so well liked.

The canvasback breeds in the Northern United States and Southern Canada. In October large flocks migrate southward as far as Central Mexico and the Gulf coast. About Chesapeake Bay they are especially numerous at that time of year, and when large wedge-shaped masses of continually-flapping wings are seen the sportsmen begin to plan days of duck hunting. When the birds reach a chosen spot for resting they wheel round and round before settling, looking first for lurking danger in the rushes.

Other sea ducks are the eider, well known and valued for the down which makes our pillows so comfortable and our coverlets so soft and warm (see EIDER DUCK); the *redhead,* much like the canvasback, and by many as highly esteemed; the *greater* and *lesser scaups,* which frequent bays and river mouths, preferring salt or brackish water, but which are also good food-birds; the finely-flavored *ring-necked ducks,* the edible *golden-eyes,* the rankly-flavored *oldsquaws* and *buffleheads,* the gay-plumaged *harlequins,* the dark-colored, inedible *scoters* and the *ruddy* ducks, which are interesting for their queer tails of stiff, pointed feathers, bare to the base. The latter are easily taken, and large numbers find their way to the markets.

River Ducks. Perhaps the most important of all ducks is a species of river duck, the *mallard,* for from it many domestic varieties have been derived. The male mallard, or drake, has deep-green plumage on the head and neck. A white collar separates the green from the dark-chestnut breast. The rest of the body is grayish-brown above, whitish below, and the four middle feathers of the tail are recurved. Some tame ducks have nearly the same plumage as this handsome wild one. Others vary greatly, being generally duller or pure white. In flocks of about fifty, mallards and other river ducks are found feeding on small grassy ponds, or on lakes or rivers, where wild rice, eelgrass and rushes are thick. In duck-hunting seasons painted wooden ducks or live ducks are anchored in the water by sportsmen to serve as decoys. These lure other ducks within range of the gunners' hiding places among the rushes (see DECOY).

The excellently-flavored mallards are found principally throughout the central parts of America, but a species just as desirable, the *black,* or *dusky,* duck, is found on the Atlantic coast. Other species of river ducks are the beautiful gray *gadwall,* which is comparatively rare; the handsomely-colored *baldpate,* as good to eat as the canvasback, for it eats the same food—in fact steals it from them; the fine table ducks, the *shovellers,* which have spoon-shaped bills; the delicious long-tailed *pintail,* and the little *green-winged, blue-winged* and *cinnamon* teals. The teals weigh but little over a pound, but are highly prized for their flesh and are regarded as great delicacies. They are easily approached, but are very rapid fliers, therefore difficult to hit on the wing. Unlike other species of duck, such as the mallards and canvasbacks, the teals drop suddenly down to the water and do not wheel about looking for danger. The most beautiful of all American ducks is probably the many-colored *wood duck,* whose numbers decreased so rapidly that the Federal migratory bird law provided for a closed season on them until 1918 (see GAME, subhead *Game Laws*).

Domestic Ducks. Some of the favorite domestic ducks in America are the white Peking, introduced from China; the large, white, excel-

lent Aylesbury, from England; the colored Rouen, from France; the huge, colored Muscovy, from South America.

Value. Duck raising has developed into a profitable industry, and American poultrymen realize about $7,000,000 a year from the eggs, feathers and dressed meat of ducks. E.T.S.

DUCK-BILLED PLATYPUS, *plat′i pus,* a peculiar egg-laying water mammal, in habit and appearance a seeming mixture of several animals. It lives in quiet streams of Australia, Tasmania and New Guinea, where large col-

DUCK-BILLED PLATYPUS

onies usually live in pairs, in burrows in the banks of streams. The burrows are furnished with two openings, one above water and one below, and sometimes they extend a long distance into the bank.

A duckbill's body is rather slender, about twenty inches long and covered with brown, water-shedding fur. Its head is small, with bright eyes, and instead of a nose it has a horny bill resembling that of a duck, except that the nostrils are at the extreme end; so, in order to breathe, the animal need only poke its bill out of water. There are no external ears, but through internal ears the hearing is very keen. The legs are short and the feet have five clawed toes each, the forefeet being webbed beyond the claws to aid in swimming, the hind feet being webbed but to the base of the claws. The male has a sharp horny spur on the heels, which he uses as a means of defense. Duckbills are very clumsy on land, but they are fine swimmers and divers, getting their food of snails, shellfish, insects and worms under water.

The female lays one or more soft-shelled eggs, which she hatches soon after laying. The young, which are born blind and naked, are then fed and cared for in much the same way as the young of other mammals. Savages hunt duckbills as food and for their skins.

DUCTILITY, *duk til′i ti,* that quality in certain substances, especially metals, by which they can easily be drawn out into thin thread or wire without breaking. Gold is the most ductile of metals, followed in order by silver, platinum, iron, copper, aluminum, zinc, tin, lead and nickel. From one grain of gold a thread 500 feet in length may be drawn. Platinum may be drawn out into a thread only 1-30,000 part of an inch in thickness. To obtain this, however, the platinum must be covered with silver, both metals being drawn out together. The silver is afterwards dissolved in nitric acid, which leaves the platinum thread intact. Glass is the most ductile of all materials, and when heated may be drawn into a thread very much finer than the threads of a spider's web.

DUDEVANT, *du d′ vahN′* MADAME. See SAND, GEORGE.

DU′EL, a combat between two persons armed with deadly weapons. In ancient times duels were frequent, and in the Middle Ages "trial by combat," as it was called, was often resorted to with full consent of the Church. It was almost universally believed that might was right, and the victor in a mortal combat was held to have been justified and sustained by divine power. The duel became most common in France during the sixteenth century, where within eighteen years 4,000 persons were killed. In England and France strict laws were enacted forbidding dueling, but the laws were not rigidly enforced. Public opinion, once aroused, proved more powerful than the laws, and dueling fell into disrepute and was finally abandoned.

The most deadly of all duels were those fought in the United States. According to the code of honor prevailing in the eighteenth and the early part of the nineteenth centuries, quarrels could be settled and insults avenged only by combat. A very rigid code of etiquette was upheld, but the duel was fought with the distinct purpose of killing, and not merely wounding, as was usually the case in Europe. The challenged party was given the choice of weapons. In France and England the sword was the favorite dueling weapon; in America pistols were generally used. Charles Lee fought a duel with John Laurens; Aaron Burr and Alexander Hamilton met on the "field of honor," from which Burr fled branded as a murderer. It was not uncommon for both combatants to be seriously wounded, and sometimes both lay dead as the result of mistaken honor. Dueling was prohibited by law in the

District of Columbia in 1839, and after the War of Secession stringent laws were passed against it by the various states.

Except for mimic duels between German students and an occasional more or less ridiculous encounter in France, the practice of dueling has been entirely abolished. In all civilized countries a man who would now kill his opponent in a duel would be regarded as neither more nor less than a murderer.

DUFF, LYMAN POORE (1865-), a Canadian jurist, since 1906 puisne (junior) judge of the Supreme Court of the Dominion of Canada. He was born in Meaford, Ontario, was graduated from the University of Toronto with honors in mathematics and metaphysics in 1887, and two years later was graduated in law. After a brief experience as a teacher in the Barrie (Ontario) Collegiate Institute he practiced law, first in Ontario and after 1895 in British Columbia. He was counsel in many notable cases, and was associated with Edward Blake in the presentation of Canada's claims before the Alaska Boundary Tribunal in 1903. From 1904 to 1906 he sat as puisne judge of the supreme court of British Columbia.

DUFFERIN, *duf'fur in,* **AND AVA,** FREDERICK TEMPLE BLACKWOOD, Marquis of (1826-1902), a British diplomat, statesman and colonial administrator, Governor-General of Canada from 1872 to 1878, one of the most honored public men of his day. He was not a great statesman, but he had a remarkable gift for diplomacy. Both in public and private life he was what is best described as a "great gentleman"—always courteous and tactful, with a charming dignity and courtly manner which no difficult situation could ruffle.

DUFFERIN AND AVA

Though Lord Dufferin was born in Florence, Italy, he was of Irish parentage. His father, Price Blackwood, Baron Dufferin, was a naval officer and the owner of rich estates in Ireland. His mother, one of the most famous women of her time, was Helen Sheridan, granddaughter of Richard Brinsley Sheridan, the orator and dramatist. She and her sisters, Georgina and Carolina, were known to society in the days of George IV as "the Three Graces." As Lady Dufferin said, "Georgey's the beauty, and Carry's the wit, and I ought to be the good one, but I'm not."

Beginning life with every advantage, with talent, wealth and social position, young Frederick Blackwood was sent to Eton and to Christ Church, Oxford, and when he was only twenty-three years old was already a favorite at court. Politically he became attached to the Liberal party, under the leadership of Lord John Russell, through whose influence he was sent on several important foreign missions. Between 1864 and 1872 he held various offices in the Russell and Palmerston ministries. In 1850 he was given a seat in the House of Lords as Baron Clandeboye, and in 1871 was created Earl of Dufferin.

It was as Earl of Dufferin that he took the position of Governor-General of the Dominion of Canada. He was one of the most popular men who have ever made their home at Rideau Hall, and at a time when a weak or tactless Governor-General might have lessened the bonds between Canada and the Empire he unquestionably strengthened them. After resigning as Governor-General, Dufferin held a number of other important posts; he was ambassador to Russia from 1879 to 1881, then ambassador to Turkey for three years, viceroy of India from 1884 to 1888, ambassador to Italy until 1891 and then ambassador to France until 1896. Queen Victoria created him Marquis of Dufferin and Ava in 1888.

Lord Dufferin received many other honors. He was at one time president of the Royal Geographical Society, and in 1891 was elected lord rector of Glasgow University. Oxford and other universities gave him honorary degrees. He wrote a number of books popular in their day, including several of autobiographical character. G.H.L.

DUGONG, *doo'gong,* a marine animal somewhat resembling the whale, found in large numbers in the Indian Ocean and on the Australian coasts. The body is long and tapering, ending in a forked or crescent-shaped tail. The paws or flippers are entirely destitute of nails and are quite useless for any purpose except for swimming. The animal varies considerably in size. The largest are said to attain a length of twenty feet, but usually do not exceed eight or ten feet. The skin is thick, smooth, of a bluish color above and white underneath. The

dugong lives on sea plants which it finds in the mouths of large rivers. The female produces only one offspring at a time, and its

THE DUGONG

curious habit of carrying the young under its fin, as a woman might carry a child under her arm, is said to have given rise to the legends concerning those beings, half-human, half-fish, called mermaids. The dugong is related to the manatee, or sea cow. It is hunted and speared for its oil and also for its flesh, which is regarded as a delicacy by the Malays. See MERMAID; MANATEE.

DUISBURG, *düs'boorK,* a flourishing manufacturing town in Germany, fifteen miles north of Düsseldorf. It is connected by canal with the Rhine and the Ruhr rivers and is the center of the coal export trade of Westphalia. There are large iron foundries, steel and chemical works, breweries, sugar refineries and machine works. Duisburg is an ancient city, the Castium Deutonis of the Romans, and early became a prominent member of the Hanseatic League (which see). It possesses a beautiful church, dating from the fourteenth century, in which is the tomb of Mercator, the famous geographer. The municipality operates and owns all public utilities and from the water supply alone receives a profit of about $55,000 annually. Population, 1919, 244,302.

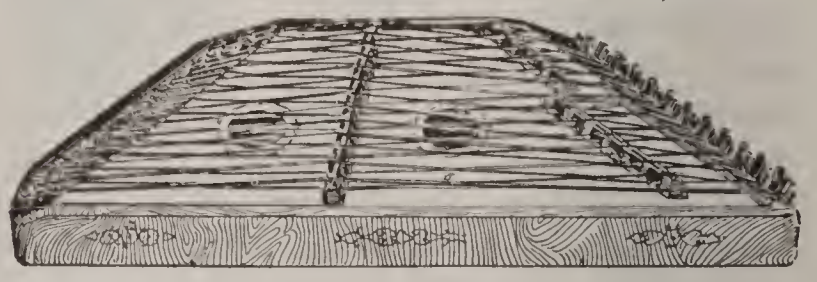
DUKE, one of the most exalted titles of European nobility. The word is derived from the Roman, *dux,* meaning *a leader,* and in ancient times the honor was purely military. *Duces,* or dukes, were placed in command of the troops in conquered territories, but were given no legislative power. Sometimes the military dukes made their power permanent and became the recognized rulers. The dukes of Normandy and Lombardy from military rulers became kings, while retaining the old title. The first English duke was the Black Prince, son of Edward III, the title of Duke of Cornwall being specially created for him.

Modern dukes have no powers above those of peers of lower order. In France the title carries no social or political distinction, but is merely used as an evidence of illustrious descent. The princes of the smaller states of the German Empire still retain the title of duke. A British duke is addressed as "Your Grace," or in writing, "The Most Noble, the Duke of ———." The eldest son is called *Lord;* with the rank of *Marquis.* Younger sons and all daughters of dukes are given the titles of *Lord* and *Lady* by courtesy. The wife of a duke is a *Duchess.*

Archduke. The title *archduke* is used only by members of the royal house of Austria. In the tenth century, Bruno, Duke of Lorraine, assumed the title, but it was not recognized as belonging solely to the Hapsburg family until about 1470.

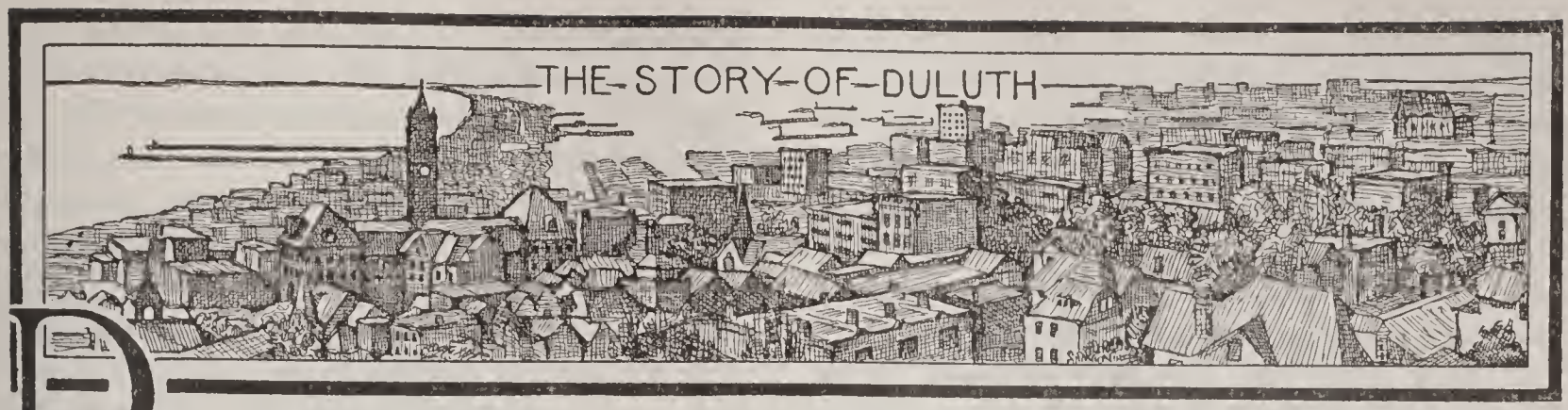
DUKHOBORS, *doo ku bawrz',* an interesting religious sect whose name of "spirit-wrestlers" has reference to their determined denial of the divinity of the Holy Spirit. The sect was founded in Russia in the early eighteenth century, and it grew rapidly, in spite of persecution; but governmental tyranny compelled the Dukhobors about the middle of the nineteenth century to emigrate, and many of them came to Canada. There they proved to be exemplary inhabitants, as their religious beliefs at no time interfere with their duty as citizens, despite the fact that theoretically they are opposed to government because the children of God, as they consider all people to be, can do no wrong and hence need no rulers. Marriages are contracted without ceremonies, but are looked upon as sacred. In 1922 thousands emigrated from Canada to Mexico.

DULCIMER, *dul'si mer,* a very ancient musical instrument which is quite a curiosity today, and of much interest because it was the forerunner of the piano. It was a flat box, of the form shown in the illustration, with a



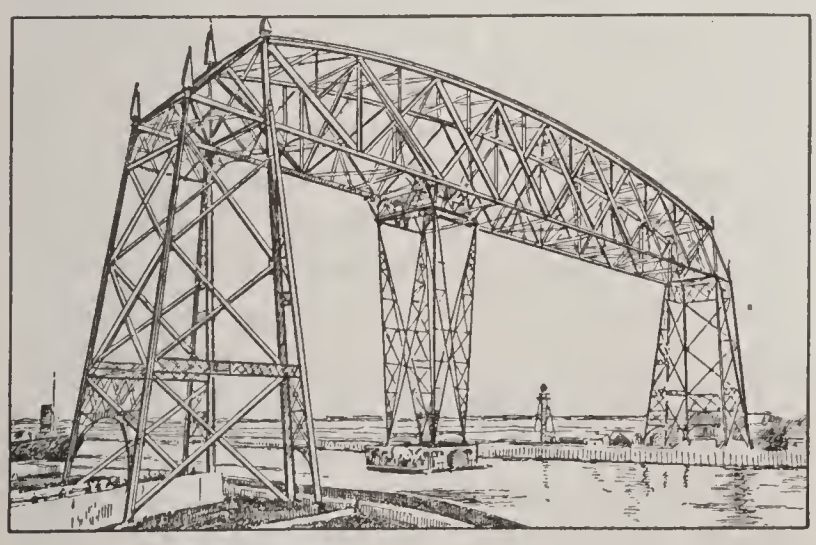
A DULCIMER

sounding board over which metal wires were strung. On one side were pegs which held the wires in place, and by tightening them the instrument was tuned; it was played by striking the wires with two cork-headed mallets. The Crusaders brought it into Europe from the East.



DULUTH, MINN., county seat of Saint Louis County, is one of the most important inland cities in the United States. The population, which is one-third foreign-born, including English, French, Canadians, Swedes, Norwegians and Germans, was 78,466 in 1910, and 98,917 in 1920. Duluth is the most westerly port on the Great Lakes, situated on Saint Louis Bay, at the west end of Lake Superior, 156 miles northeast of Saint Paul, the state capital, and 478 miles northwest of Chicago. Duluth and Superior, Wis., are separated by the Saint Louis River; between the cities is a large interstate bridge. The vast commerce of the city is handled by lines of lake freighters and by the Northern Pacific; Chicago & North Western; Great Northern; Chicago, Milwaukee & Saint Paul; Duluth & Iron Range; Duluth, Missabe & Northern; Duluth, South Shore & Atlantic; Duluth, Winnipeg & Pacific, and the Minneapolis, Saint Paul & Sault Sainte Marie railroads.

Location. Duluth has an area of more than sixty square miles, and extends for a distance of twenty-four miles along the river, bay and lake, from Lakeside, on the north, to Fond du Lac, on the south. It is finely situated on a



DULUTH'S AERIAL BRIDGE

The car is run from shore to shore by electric power. It is about twenty feet square, with areas for wagons, automobiles and foot-passengers.

sloping bluff which rises gradually from the water to a height of 600 feet, one mile inland. The harbor is one of the finest in the United States. Saint Louis Bay, nine miles long and two miles wide, is formed and protected by narrow strips of land; Minnesota Point, seven miles long, extends southward towards Wisconsin Point, which projects northward. The bay is entered between the points and through a ship canal in Minnesota Point opposite Duluth. Across this canal is a curious aerial bridge 400 feet long and 186 feet high.

Parks and Drives. The principal residence section occupies the higher part of the city's area and overlooks the lake. Rogers Boulevard, lined with handsome residences, extends for seven miles along an old terrace of the lake and offers some of the finest views in the world. The parked area of the city is 400 acres; it includes five city squares and Lester, Lincoln, Fairmount and Chester parks, and several smaller ones.

Buildings and Institutions. Prominent buildings include the Federal building, county courthouse, Carnegie Library, Y. M. C. A. and Y. W. C. A. buildings, high school, Masonic Temple, and a number of fine hotels, banks and churches. On Minnesota Point is the United States government life-saving station and a fisheries building. Duluth is the seat of an Episcopal and a Roman Catholic bishop. It has a state normal school, Sacred Heart Institute, a technical school, and a county work farm.

Industries. Duluth is one of the principal interior shipping points in the United States, so located as to be the natural channel of the vast agricultural and mineral wealth of the Northwest. The principal exports are grain, lumber and ore from the territory of the Red River Valley, Manitoba and the Dakotas and the Vermilion and Mesaba mineral ranges. The annual shipments leaving the combined port of Duluth-Superior exceed 50,000,000 tons. The iron ore shipments in 1915 amounted to over 4,000,000 tons, a figure increased to over 7,000,000 tons for 1918. Duluth and Superior have some of the most extensive coal docks in the world. Other industrial establishments

include grain elevators, saw mills and flour mills, shipyards, slaughter houses, a ten-million dollar steel plant, erected in 1915 by the United States Steel Company, a blast furnace, iron works, machine shops, a cement factory, match factories, etc. In 1920 there were 226 factories; capital employed, $72,462,000; value of products for that year, over $75,000,000.

History. Duluth received its name from Daniel de Grecylon, Sieur Du Lhut, a French trader and explorer, who visited this point about 1679. He traded with the Indians at Fond du Lac, which after 1752 was a depot of Astor's American Fur Company and is now about ten miles from Duluth. The place was settled about 1853, and the land was ceded by the Indians two years later. It was first reached by railway in 1870 and in that year became a city. In 1912 the commission form of government was adopted. G.D.MC C.

DUMA, *doo'mah,* the lower house of the Russian Parliament, officially the Imperial Duma, established by edict of the czar in 1905 and existing to the revolution of 1917. The Duma was given to the nation in response to a growing demand of the people for participation in government, but the process of election to membership did not fairly distribute representation among the classes. There were 422 members, chosen for five years. The involved election machinery kept in the majority the representatives of the wealthy landowners, and placed the representatives of the mass of the people in the minority. The Duma had joint legislative power with the Council of the Empire, of 196 members, of whom one-half were named by the czar. Bills passed by these houses were subject to veto by the czar, and, if thus disapproved, could not be voted on again without the ruler's consent.

The powers of the Duma, as well as of the Council of the Empire, were limited. All measures regarding the army and navy were outside its jurisdiction. It had absolutely no voice in more than half the items which made up the annual budget; as for the other half, if the Duma disapproved it or the czar vetoed it, the government retained the power to levy special taxes in addition to renewing the budget of the preceding period. A member could introduce a bill, but it must first be submitted to the Minister in whose department it fell. The Minister determined the form in which the bill should be presented to the houses. Amendments, however, could be offered on the floor of the house and were sometimes carried against the government. The czar had the power to issue a special ordinance (ukase) which had the force of law, at any time when the Duma was not in session; as the czar furthermore might dissolve the Duma at his pleasure, these ordinances might easily become permanent. Finally, the czar could at any time proclaim martial law, thus superseding the civil statutes. This last step was taken in Poland, in Finland and even in parts of Russia itself, in order that the opposition to the Government's policy might be crushed by force. Under these circumstances it is little short of marvelous that the Duma actually established its position as a branch of the government.

In spite of its limited functions, the Duma steadily grew more powerful, and its voice stirred to action men who were once heedless of public opinion. Especially after the outbreak of the War of the Nations in 1914 the Duma voiced the patriotism, the new nationalism, perhaps, of the Russian people. In 1916, for example, the resignation of a reactionary, strongly bureaucratic Ministry and the substitution of a more liberal one were generally attributed to the Duma's influence. The Duma was strongly in favor of a vigorous prosecution of the war, whereas there were influential men in the so-called bureaucratic circles who seemed to favor an early peace. See RUSSIA, subtitle *Government.*

DUMAS, *du mah',* the family name of two great French writers of the nineteenth century, father and son.

Alexandre Dumas (1802-1870), a French novelist and dramatist, called DUMAS THE ELDER to distinguish him from his son (see below), who inherited his literary ability. As a writer of thrilling romances, Dumas has no equal among French novelists, and his stories are probably the most widely-read in the entire realm of fiction. He was born in the town of Villers-Cotterets. His father, a general of Napoleon's army, was the son of a rich colonist of Haiti and a negress of the island. From the latter the novelist took his name Dumas, and from her, also, he inherited many of his mental and physical traits. In his youth he began the study of law, but, having had his interest awakened in the stage, went to Paris in 1823 to try his fortunes as a dramatist. In order to live until his pen should support him, he took a position as secretary in the household of the Duke of Orleans, afterward King Louis Philippe, remaining there until 1830.

Dumas' historical drama *Henry III,* performed in 1829, was the first great triumph of the Romantic French drama (see ROMANTICISM), and was followed by numerous other plays that brought him both fame and wealth. About 1839 he began his career as a writer of fiction. One of his early historical novels,

DUMAS THE ELDER

Isabelle de Bavière, suggested to him that he might present the whole history of France in a great series of narratives that should "exalt history to the height of fiction," the outcome of his idea being a group of fascinating stories that have never been surpassed for vividness, dramatic action and power to absorb the reader's interest. The best-known of these are *The Three Guardsmen,* with its two sequels, *Twenty Years After* and *The Viscount Bragelonne,* and the matchless *Count of Monte Cristo.* The adventures of the young sailor who found the buried treasure on the island of Monte Cristo have been followed with breathless interest by innumerable readers.

The novels which bear the name of Dumas number about three hundred, but the only claim that he could lay to many of these was that he had either sketched the plots or revised them before they were printed. Once his fame was established he hired writers to do the mechanical part, while he supplied the ideas. His best work was done between 1843 and 1850, and the latter period of his life was spent in wanderings through Europe in search of "copy." Though he earned enormous sums of money, his extravagance and recklessness brought him to extreme poverty in his old age, and in his last days he was cared for by his son.

Alexandre Dumas (1824-1895), son of the great novelist, is known as DUMAS THE YOUNGER. He began his literary career with a book of poems (1847), but his first real success came a year later with the novel *La dame aux camélias,* better known by its English title of *Camille* (which see). A dramatization of the book, presented in 1852, created a sensation, and the play has been enormously successful since then because of the opportunities it affords the actress who assumes the title rôle. The rôle of Camille was one of the triumphs of Sarah Bernhardt. In all of Dumas' plays he seeks to teach stern lessons of morality to a gay and thoughtless world. Among his other dramas are *The Money Question, The Prodigal Father* and *The Wife of Claude.* He was highly gifted as a dramatist, and he was elected to the French Academy in 1874. C.W.K.

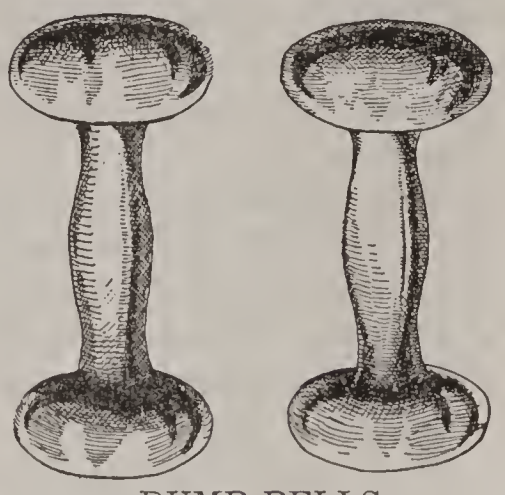
DU MAURIER, *du mo rya',* GEORGE LOUIS PALMELLA BUSSON (1834-1896), an English story-writer and illustrator, whose best-known novel, *Trilby,* created a sensation on its publication in 1894. Trilby, the heroine, is an artist's model who is brought under the influence of a Hungarian musician. By means of mesmerism she becomes one of the greatest singers of her time, but when her teacher dies she loses her powers. The book has strong dramatic qualities; a play founded on it was successfully staged in England and America.

Du Maurier, of French descent on his father's side, was born in Paris, but he entered University College, England, at the age of seventeen, and in the course of time became a naturalized British subject. In 1856 he chose art as a profession, studied in Paris and in Antwerp, and began his career as an illustrator for London publications.

In 1864 he became a regular member of the staff of *Punch,* and his drawings for that periodical gave him an enduring reputation as a skilful portrayer of the social follies of his time. Among the books for which he made illustrations are Thackeray's *Henry Esmond* and *Ballads,* Foxe's *Book of Martyrs* and novels of Henry James, Thomas Hardy and George Meredith. In addition to *Trilby* he wrote two novels, *Peter Ibbetson* and *The Martian,* and he was also the author of light, graceful verse.

DUMB-BELLS, wooden or iron weights, consisting of two balls connected by a bar a few inches in length and used in physical exercises.

In practicing with them a person holds a dumb-bell by the bar in each hand and follows a regular system of gymnastic exercises. Ordinary dumb-bells weigh from one to five pounds each, but in trials of strength very heavy ones are used. In the reign of Elizabeth dumb-bells were first made in their present form, but in the early Grecian games weights, called *halteres,* which were similar, were thrown by the quoit players.



DUMB-BELLS

DUN'BAR, Paul Laurence (1872-1906), an American negro poet, of pure African blood. He was the first of his race to express in poetry of a high order the characteristics and feelings of the American negro, but he died before his unusual powers were fully developed. His refined and delicate art is best represented by his dialect poems, in which his gift of sympathy, insight into the mind and heart of the negro and sense of humor find expression in simple and picturesque language. He was born in Dayton, Ohio, of parents who had both been slaves. The boy was given a high school education and began his literary work as a journalist in New York City. For a time he was on the staff of the Library of Congress at Washington, D. C. His collected poems are published under such titles as *Oak and Ivy, Lyrics of Lowly Life, Candle-Lightin' Time, Li'l Gal* and *Joggin' Erlong.* Among his prose writings are a volume of short stories, *Folks from Dixie,* and a novel, *The Uncalled.*

DUN'CAN, Norman (1871-1916), a Canadian novelist and educator, known for his sympathetic sketches of life among the fishermen of Newfoundland and Labrador. He was born at Brantford, Ontario, and was graduated from the University of Toronto in 1895. After working on a New York newspaper for several years, he was in turn professor of rhetoric at Washington and Jefferson College, special correspondent in Asia Minor and Egypt for *Harper's Magazine,* and then professor of English literature at the University of Kansas. In the meantime he had won considerable favor with the reading public with his stories of Labrador, including *Doctor Luke of the Labrador; Dr. Grenfell's Parish* and *The Way of the Sea.* Among his later works should be mentioned *The Cruise of the Shining Light; The Adventures of Billy Topsail; Billy Topsail & Company; The Measure of a Man; A God in Israel; The Bird-Store Man;* and *Australian Byways.* In 1912 Pittsburgh University granted him the degree of Litt. D. G.H.L.

DUN COMMERCIAL AGENCY. See Commercial Agencies.

DUNDAS', a town in Wentworth County, Ontario, is five miles west of Hamilton, fifteen miles east of Brantford and forty-five miles southwest of Toronto. It lies in a pretty valley between two escarpments, or heights of land. The Toronto, Hamilton & Buffalo and Grand Trunk railways run through Dundas, and freight is also transferred over electric interurban lines to the Canadian Pacific and Michigan Central railways at Hamilton. Population in 1911, 4,299; in 1921, 4,978.

In the early days Dundas was known as the "Head of the Lakes," and a large part of the trade of Northern and Western Ontario was carried on through the town. The Desjardins Canal, now trafficless, though still extending to Lake Ontario, was then a busy commercial waterway. With the advent of the railway, however, the water trade gradually passed to other cities more favorably located, and Dundas, with an abundance of water power, became primarily a manufacturing community. Machine tools are the product of the largest establishment in the town, and leather, gloves, baskets, clothing, yarns and knitted goods, church and school furniture and gasoline engines are also important. Dundas was founded in 1801, and was incorporated as a town in 1847. It was named for Henry Dundas, Viscount Melville (1742-1811), a British statesman who was a conspicuous supporter of Lord North's policy toward the American colonies. C.E.D.

DUNDEE', a seaport in Forfarshire, Scotland, often spoken of as the Granite City, on account of the granite of which it is built and which is extensively quarried in the vicinity. The name is a corruption of the Gaelic *Duntaw,* meaning the *fort on the Tay.* The city is situated on the north shore of the River Tay, ten miles from the sea and fifty miles northeast of Edinburgh. It is well laid out, with broad streets and a splendid esplanade along the river bank. Dundee is the center of the British jute trade and also produces more linen goods than any other town in Scotland. Shipbuilding and engineering are important industries. Until recent years Dundee sent

TYPES OF SAND DUNES

The three illustrations are from photographs taken on the southeastern shore of Lake Michigan, in what it is expected will some day be Indiana Dune Park.

out many vessels to the northern seal and whale fisheries, but that industry is now comparatively of little importance. The city is one of the naval aeroplane stations of Great Britain.

The public utilities are owned by the municipality and are profitably operated, all surplus being devoted to the reduction of taxation. During the almost constant struggles between England and Scotland Dundee frequently changed hands. In 1385 it was burned by the Duke of Lancaster, and in 1651 General Monk sacked and burned it after massacring 1,000 of the inhabitants. Population, 1921, 168,217.

DUNE, a hill or mound, common in all sandy regions, formed of sand drifted by the wind. The wind blows the sand like snow, and when it strikes any obstruction it falls. Each succeeding wind adds to the amount first deposited, and in this way a small mound grows in the course of years to a hill.

Sand dunes are most numerous in desert regions and on or near large bodies of water. They occasionally reach a height of 500 or 600 feet, but most of them are much lower. Sometimes their surface becomes rippled by the wind, and presents an appearance similar to that of a lake stirred by a gentle breeze. Dune Park, Indiana, on the south shore of Lake Michigan, is one of the most remarkable dune regions in the world. It is not in reality a park, that name being given the miles of sandy waste and scrub oak by courtesy; but in 1916 steps were taken to form the territory into a state park by action of the legislature. The Indiana dunes are among the most interesting formations of the kind in the world, and great geographers make long journeys to view and study them. The eastern shore of Lake Michigan is also noted for its dunes.

DUNEDIN, *dun e' din,* one of the principal cities of New Zealand, and capital of the district of Otago. It is situated in the South Island, at the head of a fine natural harbor fifteen miles from the sea. The city was founded in 1848; in 1861 it became the center of a rich gold-mining district and from that date its growth was rapid. It is connected by rail with Christchurch in the north, with Invercargill in the south, and by a regular line of steamers with Australian ports. The surrounding country is noted as a wool-growing section;

the city manufactures large quantities of woolen goods for home consumption and exports raw wool to England. Apart from agriculture the chief source of wealth lies in gold dredging, which, however, is now almost entirely in the hands of a few large companies. Dunedin has beautiful suburbs, on hills overlooking the harbor, each suburb forming a separate municipality. Population in April, 1921, 72,255.

DUNFERMLINE, *dun ferm' lin,* an ancient city of Scotland, in the County of Fife, sixteen miles northwest of Edinburgh. It was the favorite residence of early Scottish kings and the birthplace of James I and Charles I of England. The name is Gaelic, and means *fort on the crooked stream.* It was an important town before the days of the Norman conquest of England (1066) and is full of interesting historical remains. Beneath the pulpit in the Abbey church, built on the site of an ancient Benedictine abbey, lie the remains of King Robert Bruce, hero of Bannockburn (which see). Until the eighteenth century the town had no manufactures, but in 1718 the weaving of damask was introduced by a man who by pretending to be an idiot had gained entrance to workshops in Edinburgh and learned the strictly-guarded secrets of the art. Dunfermline soon surpassed Edinburgh and all other towns in Great Britain in the quality and design of its damask.

Andrew Carnegie was born in Dunfermline in 1837, and has been the town's greatest benefactor. He presented to the city of his birth a public library, baths and the beautiful estate of Pittencrief Park, together with other property and bonds yielding an income of $125,000 a year. Daniel Defoe described Dunfermline in the eighteenth century as showing the "full perfection of decay," but it is now among the most flourishing towns in Scotland, with important industries, including brass and iron founding, tanning, brewing and distilling, rope making and bleaching; there are numerous collieries in the immediate vicinity. Population in 1921, 39,886.

DUN'KERS, DUN'KARDS or **TUN'KERS,** from the German *tunken,* meaning *to dip,* is the name of a sect of German-American Baptists which originated in Westphalia, Germany, about 1708. Their founder was Alexander Mack. They derive their name from their mode of baptism by immersion, or dipping. Early in their history persecution compelled them to flee to Holland, and later they emigrated to the United States, where they settled near Philadelphia. They are distinguished by extreme simplicity of attire, and are opposed to divorce, oaths, warfare and the use of alcohol and tobacco. They reject infant baptism and the use of medicine, replacing the latter with prayer and anointment with oil. They are now found in almost every section of the United States, particularly in Pennsylvania, Maryland, Virginia, Ohio and Indiana. In 1905 their total membership was about 115,000.

DUN'KIRK, or **DUNKIRQUE,** is a fortified seaport in the north of France on the Strait of Dover, twenty-eight miles northeast of Calais. During the War of the Nations it was an important military base and landing place for British troops. It was repeatedly shelled by long-range German artillery, at a distance of twenty miles, for it was in the direct line of German aspirations looking to the capture of the entire Channel coast of France, especially Calais. This campaign failed, and the bombardment did not entirely destroy Dunkirk.

The city lies in a network of canals connecting it with inland towns of France and Belgium, and has an excellent harbor, its importance as a port rivaling that of Bordeaux. It has manufactories of jute, hemp, cotton and flax, iron foundries, machine factories, breweries, sugar refineries and shipbuilding yards. The streets are wide, well paved and clean, but there are few buildings of any architectural beauty. Population is about 38,000; but during the War of the Nations thousands sought refuge elsewhere, and business interests suffered greatly.

DUNKIRK, N. Y., a city in Chautauqua County, on the shore of Lake Erie, forty miles southwest of Buffalo. It is on the New York Central Lines; the Pennsylvania; the Erie; the New York, Chicago & Saint Louis and the Dunkirk, Allegheny Valley & Pittsburgh railroads. Lines of freight and passenger boats ply between this and other lake ports. In 1910 the population was 17,221; in 1920 the Federal census reported 19,336. The area is nearly five square miles.

The city was named from the similarity of its excellent harbor, which is protected by a breakwater, to that of Dunkirk, France. It is well situated on bluffs high above the lake, and has Point Gratiot and Washington parks, Brooks Memorial Hospital, a Carnegie Library, Masonic Temple and Odd Fellows' Temple. Dunkirk is in an agricultural and grape-growing country and has an important trade in farm

produce and in food fish taken from the lake. The industrial enterprises include locomotive works, which employ 3,500 men, steel axle and radiator factories, planing mills and glove and shirt factories.

A settlement at Dunkirk in 1805 was incorporated as a village in 1837. It became a city in 1880.

DUNMORE, PA., a residential suburb of Scranton, which it adjoins on the southwest. It is situated in Lackawanna County, in the northeastern part of the state, and is served by the Erie Railroad. Electric lines extend northeast and southwest of the city. In 1835 the first settlement was made, and in 1862 the borough was incorporated. Italians, Poles, Slavs and Hungarians comprise one-third of the population, which increased from 17,615 in 1910 to 20,250 in 1920. The area exceeds eight square miles.

Though Dunmore is primarily the residence of a large number of people who have employment in Scranton, it has large home interests in anthracite coal mining, about 5,000 people being engaged in this industry. The city has Saint Mary's Academy, the State Oral School for Deaf and Dumb, Saint Joseph's Infant Home, and homes for the aged and friendless.

DUNNE, *dun,* FINLEY PETER (1867-), an American journalist and humorist, was born and educated in Chicago. He gained wide newspaper experience on the staff of Chicago newspapers, and became famous through his creation of the character of *Mr. Dooley,* the genial philosopher of Archey Road, for whom a Chicago newspaper man furnished the inspiration. Mr. Dunne is the author of *Mr. Dooley in Peace and War, Mr. Dooley in the Hearts of His Countrymen, Mr. Dooley's Philosophy,* etc. He has for some years syndicated his material, thus bringing *Mr. Dooley* and himself nation-wide publicity.

DUNN'VILLE, a town in Haldimand County, Ontario, forty-three miles west of Buffalo and thirty-four miles southeast of Hamilton, on the Grand Trunk Railway and the Grand River; this is navigable from its mouth in Lake Erie to this town, a distance of five miles. Dunnville is also served by a branch line of the Toronto, Hamilton & Buffalo Railway. It is an important manufacturing center, the chief products being flour, knitted and woolen goods, canned and dried fruits and vegetables, sewing machines, hammocks, bricks and boats. Population in 1911, 2,861; in 1921, 3,224.

DUNSMUIR, *dunz'mewr,* JAMES (1851-), a Canadian capitalist and legislator, formerly premier and later lieutenant-governor of British Columbia, and one of the wealthiest men in the province. He was born at Fort Vancouver, Washington, attended school at Nanaimo, British Columbia; Hamilton, Ontario; and Blacksburg, Virginia, and then was given a business training by his father, who developed the first important coal mines in British Columbia. On the death of his father, Dunsmuir became president and chief owner of various coal companies and also of the Esquimalt & Nanaimo Railway, which he sold to the Canadian Pacific Railway in 1905. He has given largely of his wealth to educational and charitable institutions. Dunsmuir entered the British Columbia legislature as a Conservative in 1898, and from 1900 to 1902 was premier and president of the council. From 1906 to 1909 he was lieutenant-governor of the province. G.H.L.

DUNS SCOTUS, *dunz sko'tus,* JOANNES (1265-1308), was a Roman Catholic divine and one of the most profound thinkers of the Middle Ages. His birthplace is unknown. He entered the Order of the Franciscans, studied at Oxford and in 1301 became professor of theology there. He successfully defended the doctrine of the Immaculate Conception, afterwards (1854) declared a Roman Catholic dogma, against Thomas Aquinas, a noted Dominican scholar. For his brilliant handling of the matter he was awarded the title of *Doctor Subtilis,* or the *Subtle Doctor.* The Scotist philosophy establishes the necessity for divine revelation on the ground that reason is insufficient to teach us the highest end of our existence, the knowledge of God. The most famous work of Duns Scotus, besides his commentaries on the Bible and Aristotle, is the *Opus Oxoniense* ("Oxford Work").

DUNSTAN, SAINT (925-988), an English archbishop and statesman, was born and educated at Glastonbury, and afterwards became abbot of the monastery there. During the reigns of kings Edmund and Edred, Dunstan acted as their adviser, instituting many wise religious reforms and aiding in the conquest of the Danes. He gained the ill-will of King Edwy, successor of King Edred, because he had publicly rebuked him, and as a result of this act he was deprived of his offices and banished. He returned to England in 958, was made bishop of London in 959 and Archbishop of Canterbury in 960. Edgar, Edwy's successor, approved of Dunstan's reforms, and gave him every assist-

ance. On the death of Edgar in 975, Dunstan again lost prestige and retired to Canterbury, where he remained until his death. He was considered a great scholar and statesman who labored energetically toward the advancement of religious freedom.

DUNVE'GAN, a town in Northern Alberta, on the Peace River, 275 miles directly northwest of Edmonton and about 340 miles by rail. The Edmonton, Dunvegan & British Columbia Railway, under construction in 1917, will provide transportation both east and west. Dunvegan has been known for many years as a Hudson's Bay Company post, with a population of a score or two. The completion of railways to the Peace River country, however, will make it a central outfitting and distributing point. For detailed information, see PEACE RIVER.

DUQUESNE, *doo kane',* PA., a borough in Allegheny County, in the southwestern part of the state, one mile from McKeesport and twelve miles southeast of Pittsburgh, on the Monongahela River and the Pennsylvania Railroad. The city has extensive blast furnaces and steel works. It was settled in 1885 and was incorporated in 1891. The population was 15,727 in 1910, and 19,011 in 1920. The area is about two square miles.

DURANGO, *doo rang'go,* capital and leading commercial city of the state of Durango, in Mexico. It is situated on an elevated plateau nearly 7,000 feet above sea level and about 500 miles northwest of the city of Mexico. The climate is mild and healthful and the surrounding district is extremely fertile. The city has cotton and woolen mills, iron foundries, tobacco factories and large flour mills, and in normal times is the center of important mining industries. Hot mineral springs are numerous in the vicinity. Population in 1910, 34,085.

DURANT', HENRY FOWLE (1822-1881), the founder of Wellesley College. His life is recorded under the description of that school, in Volume VIII.

DUR'BAN, the chief seaport of the province of Natal, in the Union of South Africa. The town was founded in 1834 and named after Sir Benjamin D'Urban, then governor of Cape Colony. The business section of the town is situated mostly on low-lying land on the north of its harbor, which is known as Port Natal. The residential district is on a range of hills called the Berea, overlooking the harbor. There is an excellent street railway service, but "rickshaws" (see JINRIKISHA) drawn by stalwart Zulus are still popular vehicles. Extensive dredging operations in 1904 opened the harbor to the largest mail steamers, and all the import and export trade of Natal and a great quantity of that of the Orange Free State and the Transvaal now passes through Durban. Population in 1911, 72,512.

DURBAR, *dur'bahr,* a Persian word meaning *audience,* but now used chiefly in India with reference to conclaves at which treaties and other important affairs of state are discussed, and also to great meetings held to pay honor to distinguished visitors. Queen Victoria was declared Empress of India in 1877 at Delhi before the princes, rulers and chiefs of India assembled "in durbar." King George V and Queen Mary were similarly greeted in 1911 at a durbar of great magnificence. The native princes vied with each other in making the most gorgeous display, the wealth represented by the jewels and precious stones worn in gaily-colored Eastern dresses and turbans being almost fabulous. It was immediately following that event that Delhi was made the Indian capital, Calcutta losing the distinction.

DÜ'RER, ALBRECHT (1471-1528), a German painter, engraver and designer, the greatest master of the period known as the German Renaissance (see RENAISSANCE), and one of the most influential artists his country has ever produced. He was born in Nuremberg, where he worked for a time with his father at the goldsmith's trade. At the age of fifteen he became apprentice to the painter Wohlgemuth, studied with him for three years, and after spending four years in travel as a journeyman painter settled in Nuremberg as an independent master.

In 1505 he visited Venice, where his study of the Venetian masters refined his art and broadened his vision. Even more important was the influence of the early Flemish painters (see EYCK), whose works he studied while on a visit to the Netherlands in 1520. His own paintings thereafter showed an excellence in coloring that was formerly lacking, and his return to Nuremberg marked the beginning of his last and greatest period.

As a creative and transforming force in German art, Dürer holds first place. His theory that art should be a record of fact is illustrated in the accuracy of his portrait paintings. He invented a process of printing woodcuts in two colors, and perfected the art of engraving by combining the methods used in etching and engraving on copper. Excellent examples of

his engravings are *Death and the Devil* and *Saint Jerome in His Study;* famous among his woodcuts are *The Smaller Passion* and *The Apocalypse.* His masterpiece of religious painting is *The Four Apostles,* now in the Munich Gallery, consisting of two panels of life-size figures of the Apostles John and Peter, Mark and Paul. Dürer enjoyed high honor and esteem in his lifetime; he was court painter for the emperors Maximilian I and Charles V. Among his friends were Luther, Melanchthon, Erasmus and Raphael. B.M.W.

DURHAM, *dur'um,* JOHN GEORGE LAMBTON, Earl of (1792-1840), an English statesman, known to his contemporaries as "Reformer Jack," one of the most radical of the Liberal leaders of his day; now remembered chiefly as the principal author of the great Reform Bill of 1832 and as the writer of a *Report on the Affairs of British North America,* a document which was directly responsible for the union of Upper and Lower Canada and laid the foundation of British colonial policy up to the present time. Lord Durham was a great popular leader, and filled a larger place than many men whose names are familiar to-day. If his fame is dimmed by time, and if an early death robbed him of the highest honors, yet the principles for which he fought have triumphed.

EARL OF DURHAM

Though the Lambtons were a family which had for nearly seven hundred years owned a vast acreage of land, the family traditions were of a pronounced Whig type. The grandfather of the Earl of Dunham had refused a peerage, and his father was a vigorous defender of popular rights. Young Lambton was sent to Eton, and then for a short time held a commission in a regiment of Hussars. In 1816 he married Louisa Elizabeth, daughter of Earl Grey. She was his second wife; his first wife, with whom he had eloped to Gretna Green in 1812, died early in 1815. Meantime, on reaching his majority in 1813, he was elected to the House of Commons, where he became a fearless advocate of reform and generally opposed the Tories. His marriage to Earl Grey's daughter strengthened his political position, and by 1818 he seems to have been more or less in the confidence of his father-in-law and other Whig leaders. But he was too radical for these aristocrats, and their distrust of him was not lessened by his great speech in 1821 on Parliamentary reform. This was eleven years before the Reform Bill, yet in it he advocated more thoroughgoing reform than provided by that law. In 1828 Lambton was raised to the peerage as Baron Durham.

In November, 1830, when Earl Grey succeeded the Duke of Wellington as Prime Minister, Durham entered the Cabinet as Lord of the Privy Seat. He was almost immediately appointed chairman of a committee of four to draft the Reform Bill. Most of the work was done by Durham himself, the other three members being his assistants rather than collaborators. Durham himself selected one of them, Lord John Russell, to present the bill to Parliament. After the passage of the Reform Bill, Durham undertook a special mission to Russia, and on his return in the spring of 1833 was created first Earl of Durham and Viscount Lambton. He was again ambassador to Russia, from 1835 to 1837.

His Services to Canada. As early as July, 1837, Viscount Melbourne, then Premier, urged Durham to undertake the government of Canada, where affairs had come to an alarming crisis. Durham at first refused, but some months later accepted. By a special act of the British Parliament he was given almost dictatorial powers in Canada, and he had the assurances of Melbourne that the government would give him "the firmest and most unflinching support." Durham arrived at Quebec on May 27, 1838, and sailed from Quebec for England on November 3 of the same year. In this brief period he gained a marvelous insight into the true needs of Canada. The rebellions led by Papineau and William Lyon Mackenzie had already been crushed, but disaffection still remained. Durham, loath to punish the rebels as traitors, issued a proclamation of amnesty on June 28, 1838, the day of Queen Victoria's coronation. From the benefits of this proclamation twenty-four of the leaders were excluded. Eight of them were already in prison and were to be exiled to Bermuda; the remaining sixteen, including Papineau, were fugitives, and were forbidden to return to Canada on penalty of death.

Durham was undoubtedly justified in feeling that this extraordinary use of his power would be sustained, and public opinion of the

colonies did support him, but in England partisan motives led to violent attacks against him, on the ground, which could not be denied, that he had exceeded his powers. The Melbourne Ministry, false to its promise, did not defend Durham, and the Canadian ordinance which was to carry Durham's plan into effect was disallowed by the home government.

Durham, high-spirited and hot-headed, was indignant at this reversal, and left Canada without waiting for his resignation to be accepted. In his famous report on the conditions he found, one of the greatest state papers in the English language, he outlined the future of Canada. Believing that the ideal to be kept in view was a federation of all the colonies in North America, he advised the legislative union of Upper and Lower Canada as the first step. He also urged that the mother country furnish aid to immigration, that an intercolonial railway be built at once, and that an executive council responsible to the legislature be established. Durham's health had long been failing, and he lived to see only the first of his suggestions adopted; he died on July 28, 1840, just five days after Queen Victoria had given her assent to the act uniting Upper and Lower Canada. G.H.L.

DURHAM, N. C., a city famous for its tobacco industry. It is the county seat of the county of the same name, situated about midway between the geographical center of the state and its northern border. Raleigh is twenty-six miles southeast, Greensboro is fifty-five miles west, and Washington, D. C., is 288 miles northeast. Transportation is provided by the Southern, the Seaboard Air Line, the Norfolk & Western, the Durham & Southern and the Durham & South Carolina railways. The population increased from 18,241 in 1910 to 21,719 in 1920; about one-third of this number are negroes. The area of the city exceeds three and three-quarters square miles. The city is popularly called the *Bull City,* because a fine breed of cattle is known as the *Durham.*

Durham is the center of an important tobacco and cotton district, and the manufacture of a famous brand of smoking tobacco is the staple industry of the city. The plant engaged in its production is one of the largest granulated smoking-tobacco factories in the world. The manufactures of snuff, cheroots, cotton knitted goods, fertilizers and dyestuffs are also important. Watts Hospital (white), Lincoln Hospital (colored), the post office and a library are the notable buildings. In addition to its public school system the city has Trinity College (Methodist Episcopal), opened in 1851, a school of fine arts, a conservatory of music and a business school.

The city was settled in 1855, incorporated in 1869 and made the county seat in 1881. It was named for Dr. Bart Durham. Z.A.R.

DUSE, *doo'za,* ELEANORA (1859-), a great emotional actress, was born in Vigevano, Italy. She began her career at an early age and in commonplace surroundings. Her genius remained unrecognized until in 1879 she appeared at Naples in Zola's *Therese Raquin.* She was undoubtedly the inspiration of many of Gabriele D'Annunzio's best-known plays, in which she appeared; among these are *Gioconda* and *Francesca da Rimini.* She abstained from theatrical make-up and mannerisms, and her art, while simple, was distinguished by great intensity. In the characters of *Santuzza, Camille* and *Marguerite,* she achieved her greatest triumphs. Her tours in the United States and Canada between the years 1893 and 1903 were artistically and financially successful. Soon after her return to Italy from her second American tour she retired from the stage.

DÜS'SELDORF, a famous art, educational and industrial center of Germany, and one of the most beautiful cities of the empire. The town dates from about 1250. It is situated at the confluence of the rivers Düssel and Rhine, twenty-two miles northwest of Cologne, and is divided into five sections. In some parts the streets are crooked and narrow, but the more modern portions are well planned, with fine buildings, well-shaded avenues and large squares. It is only within recent years that the city has become industrially prominent, iron and steel manufactures having been developed with great rapidity. There are also manufactures of cotton goods, carpets, leather, tobacco and chemicals. All public utilities are municipally owned and operated by the city with the efficiency for which the Germans are noted. The Düsseldorf school of painting, an outgrowth of the Academy of Art founded in 1767 by the Elector Karl Theodor, is still the most important of all German art schools. Population in October, 1919, 407,338.

DUST, ATMOSPHERIC. Of the variable constituents of the atmosphere, water vapor and dust, strangely enough, are closely dependent one upon the other. When the temperature of the atmosphere falls to the dew point—that is, the temperature at which water vapor changes to a liquid form—the condensation

takes place very gradually. The dust particles cool more rapidly than the gaseous parts of the air, and each particle becomes the nucleus of a droplet of mist. The masses of mist form cloud, from the lower surface of which the mist gathers into rain drops. Were it not for this beneficent provision of nature almost every rainstorm would be a fierce deluge of down-pouring water out of a cloudless sky. There would be no gentle summer showers; and if there were clouds the clouds would be of a form and composition now unknown. A knowledge of the nature of the dust content of the atmosphere is quite as important as that of the water-vapor content, for, in a way, it has quite as much to do with the distribution of rain. It is not far from the truth, therefore, to say that atmospheric dust is the parent of cloud, just as cloud is the parent of rain.

Two Kinds of Atmospheric Dust. Broadly speaking, atmospheric dust may be classed as consisting of two kinds: the dust motes or floating matter of the air, and the flying dust that is swept from bare surfaces of the ground and carried into the air by the wind. A distinction of this sort, however, is not exact; it is merely one of convenience, for there are dust motes that settle to the ground, and particles of flying dust that practically do not. Theoretically, all matter not in gaseous form is supposed to settle to the ground; practically, much of it remains in suspension for an indefinite length of time. Every fall of rain or of snow brings these particles to the ground in numberless millions; electrification and winds drive them into the air again. If the earth and the dust motes are similarly electrified the latter are repelled. At such times they accumulate until the air next the ground becomes more or less hazy.

Mr. John Aitken, a Scotch meteorologist, has devised a very ingenious method of estimating the number of dust motes in a given volume of air. A measured quantity of air confined in a receiver is suddenly cooled below the dew point. The moisture of the air condenses on the dust motes and they fall upon a plate of black glass ruled in such a manner that the droplets may be readily counted with a strong magnifying glass. Mr. Aitken finds that if the air contains not more than 8,000 dust motes per cubic inch, it is fairly clear and the outlines of distant objects are plainly visible. On the other hand, when about four times that number are present, the air is very hazy. On a very clear day following a shower, the number may be less than 4,000 per cubic inch; ordinarily, however, the number is not far from 8,000 to 12,000 per cubic inch.

Sources of Dust Motes. Dust motes come from various sources. Undoubtedly some are particles of wind-blown earthy matter that by long attrition, or wearing away, have become so minute that they remain suspended in the atmosphere until brought down during a shower. A large proportion are of volcanic origin. The eruption of Krakatoa, in Sunda Strait, ejected so much floating matter into the atmosphere that red sunsets and hazy conditions caused by it lasted for several years. The chimney stacks out of which the burnt products of ten billion tons of coal are yearly poured also account for a considerable proportion of the motes. The wind-whipped sand of the sea furnishes its quota, and the proportion is not small. The "chlorine zones" which so many boards of health in seacoast cities are now studying are strips of seacoast in which salt prevails in the air. But many dust motes are of meteoric origin—that is, they are matter which, for want of a better name, may be called *planetary dust,* which the earth gathers from space. Some of these particles are very much like the lava of terrestrial volcanoes; some are spherules of iron. The latter may be gathered by a magnet from the dust accumulations of undisturbed niches and corners; they may be gathered also upon a microscope slide which rests upon a magnet. In any case the difficulty in examining them is considerable, and the slightest jar will cause them to fly into the air.

Dust motes apparently do not affect the sanitary condition of the air. There is no evidence to show that the health of a community is affected by them. Because they are such important factors in the production of rain, dust motes should be considered, not as "foreign matter of the air," but as a real and essential part of it; moreover, without a knowledge of the part they play, the study of atmospheric moisture is incomplete.

Flying, or Wind-Blown, Dust. The flying, or wind-blown, dust of the atmosphere at first thought might appear to differ from the dust motes only in the size of the particles; as a matter of fact, however, the work they perform in nature is vastly different. Dust motes exist at a height of ten miles or more in the air; flying dust rarely is carried higher than a few hundred feet. Yet in that low altitude

flying dust is a physiographic agent that performs a wonderful amount of work. Flying dust, snatched from the deserts of Central Asia, is borne across high mountains and has filled the valley of the Hoang River, "China's sorrow," hundreds of feet deep. The wind-blown dust—*loess,* it is called— is brought into the valley more rapidly than the river can carry it away. As a result, the sediment which the river tries to carry, but cannot, causes overflows and floods that are terribly destructive. Years ago the Hoang flowed into the delta of the Yang-tse-kiang; now its mouth is in the Pechili, several hundred miles north of the Yang-tse delta. Flying dust filled and leveled the valleys between the block mountains of the Western highland region; it cut the Gulf of California in two, leaving the remnant now known as Imperial Valley; and it was the chief factor in leveling the surface of the plains between the Missouri River and the Rocky Mountains. Wind-blown sand is forever rearranging a considerable part of the coast line of the United States, thereby making the work of the Coast Survey a never-ending task.

The wave of sand which swept Cape Henlopen, on the east coast of Delaware, is an illustration of the movement of flying and rolling dust. It must be borne in mind that any slight increase in the velocity of the wind adds enormously to its carrying power; doubling its velocity increases the carrying power sixty-four-fold. The burning of the shrubbery and trees left a denuded area of sea sand. The wind immediately began to blow the sand, which had been protected from it by the shrubbery, and in a few years a drifting dune about a mile long and seventy feet high began to travel westward. In the course of fifty years the dune traveled westward a mile or more, stopping only when the force of the on-shore winds was balanced by that of the currents blowing from the land.

In the foregoing cases it should be noted that the tremendous effects of wind-blown dust are confined to areas that have but little rainfall and, therefore, little or no shrubbery and vegetation. The flying dust in such regions consists almost wholly of earthy matter, and its composition does not differ from that of the rock from which it is worn.

Varieties of Wind-Blown Dust. In regions of generous rainfall the ground is protected by grass and other vegetation. About the only denuded surfaces, sea and lake shores excepted, are public streets, playgrounds and areas in which constant treading prevents the growth of vegetation. As compared with arid regions the amount of flying dust is infinitesimal. Small as the quantity is, however, flying dust, considered from the standpoint of public health, is an extremely important factor of the air, especially in large cities.

In order to carry on the study of flying dust, microscope slides may be exposed on sills about twelve feet from the ground. In the following experiments they were exposed from the sills of laboratory windows, on one side facing several hundred feet of lawn, on the other facing a much-traveled public highway. The slides on the sill facing the lawn faced also the prevailing northwesterly winds. The flying dust caught on these slides consisted mainly of soot from chimney stacks several miles away, the pollen of flowers, the scales of lepidopterous (scaly-winged) insects, the eggs of insects, the smut and similar parasitic growths on vegetation, meteoric iron, ash, earthy matter and various particles of unknown character. Slides exposed in rural sections of the country (all in Southern New York) gathered about the same kind of material, containing perhaps a greater variety of pollen, but less of chimney products. In regions where soft coal is extensively used, soot and other chimney products are the prevailing dust content of the atmosphere.

Flying Dust May Carry Disease. At all exposures facing public streets the earthy matter composing the surface of the street top dressing, together with horse manure, constitutes the bulk of the flying dust. In several instances, after the streets had been covered with tar, the daily catch of dust was reduced about ninety-five per cent, but the remaining catch consisted almost wholly of manure. Because of its lightness this material is easily carried by the wind—more easily, indeed, than earthy matter. It pervades the innermost recesses of dwellings—especially drawers and closets of rooms that face dusty streets. Wherever there are air currents they will carry dust of this character. Practically all food supplies, except those hermetically sealed, are plentifully besprinkled with it. Fortunately, by the time it has been rain-soaked, dried and ground into fineness, it is comparatively harmless—more so, in all probability, than the garbage, putrescent matter and sputum that, thrown upon street pavements, sooner or later find their way into the air as flying dust.

As a rule, the wind-blown dust from city streets and country roads is low-flying. Excepting in times of high winds, only a very small proportion is carried higher than 100 feet, and, fortunately, small insects such as flies, ants in their winged stage, and mosquitoes rarely reach this altitude unless blown upward by the wind. Perhaps the dangers of communicable disease from wind-blown street dust have been exaggerated; certain it is, however, that dust is unpleasant and uncomfortable. What is still more important is the fact that much of it is preventable. Tarring or oiling dirt roads and washing hard-paved streets will reduce the amount of flying dust to a minimum. J.R.

DUTCH GUIANA, *ge ah'nah,* a tropical, only partially explored South American colony belonging to the Netherlands. In 1667 it was given to the Dutch by England, in exchange for New Amsterdam, the present New York City. North of Dutch Guiana lies the Atlantic Ocean; on the east, the River Marowijne, or Maroni, divides it from French Guiana; on the west, the River Corentyn separates it from British Guiana, and on the south inaccessible mountain forests divide it from Brazil. Covering an area of 46,060 square miles, it is a little larger than Mississippi, but its reported population of 113,181 in 1921, which does not, however, include negroes and Indians of the forests, is only one-twentieth of the population of that American state. Dutch Guiana is sometimes called *Surinam,* after its chief river.

LOCATION MAP

The position of Dutch Guiana in the continent, showing the proportion of South America it occupies.

The Land. The coastland of Dutch Guiana is flat, mangrove-covered swamp land, but inhabited portions are protected by dams and drained by narrow canals. The interior is mountainous and thickly forested. Numerous streams keep the land well watered, and the soil is fertile, but only a small portion is under cultivation. The country's most important waterway, the Surinam and its branches, drains central Dutch Guiana. About ten miles from the mouth of the Surinam lies Paramaribo, the capital, supporting nearly half the population of the country.

So hot and moist is the climate that, besides natives, the population consists chiefly of peoples of countries with similar conditions to combat—Indians, negroes, Chinese and Japanese. There are fewer than 1,000 Europeans.

COMPARATIVE AREAS

The text compares Dutch Guiana with Mississippi. Comparison with a northern state shows it to be about 600 square miles larger than the state of New York.

Resources. Sugar, cacao, bananas, rice, maize and coffee are grown, chiefly on plantations on coast lands and lower river courses. Those products furnish the principal wealth of the country, as the forests, though filled with trees of value, are still unexplored. Gold is found and mined, and the yearly output is estimated at over $400,000. The imports of Dutch Guiana, however, always exceed its exports.

Government and Religion. Executive powers are in the hands of a governor (assisted by a council of three members) and a vice-governor. The governor is president of the council; all are named by the sovereign of the Netherlands. The colonial assembly, or *states,* is the legislative body. Members of that body are chosen locally by electors, in the proportion of one for each 200 electors. Dutch Guiana is divided into thirteen districts and numerous communes. The official language is Dutch, but English is also used. Three cantonal courts, two circuit courts and a supreme court at the capital administer justice.

All religions are permitted; the people are mainly Mohammedans, Hindus, Moravian Brethren and Roman Catholics, there being but a small number of Lutherans and Jews.

History. Since 1667, when Dutch Guiana

became one of the Netherlands' possessions, it has been twice in England's power, from 1799 till 1802, and from 1804 to 1816. The most important event in its history since then was the abolition of slavery in 1863. The labor problem then became serious, and the agricultural industries of the country were almost ruined. No completely satisfactory solution was found, but at the end of the nineteenth century the Netherlands showed increased interest in the colony by establishing navigation service to Paramaribo. An experimental botanical garden has been established in that city to encourage agricultural activities. M.S.

DUTCHMAN'S BREECHES, *brich'es,* an odd springtime flower, whose lovely white blossoms tinged with creamy yellow hang in trembling clusters at the end of long, straight stalks, which shoot up directly from the root. From

DUTCHMAN'S BREECHES

four to eight of the dainty flowers are found in a cluster, while fine, lacelike leaves of a pale grayish-green color form a heavy foliage around them. The shape of the flower shows the origin of its humorous name, for the four petals are united in pairs, two of them forming a large double-spurred sac, and the other two, which are very small, forming a protection for the stigma. The roots are a collection of small solid tubers enclosed in a sheath, or scaly skin. The flowers may be found in bloom during April and May in rich, rocky woods from Nova Scotia to the Carolinas and as far west as Nebraska.

DUTIES, *du'tiz.* See TAX; CUSTOMS DUTIES.

DVORAK, *dvor'zhahk,* ANTONIN (1841-1904), a Bohemian musical composer, born in Mühlhausen, who began early in life to make a living with his compositions and by playing in small orchestras and in cafes. He grew up among Bohemian peasants, and he learned to love their folk songs so much that he embodied them in many of his finest themes. Not until he reached manhood was he enabled to have access to the compositions of Beethoven and Mendelssohn, and the study of their original scores induced him to try the larger forms and resulted in his composing a number of symphonies, operas, sacred compositions and some chamber music. But his best works, excepting the *Stabat Mater* and *Requiem Mass,* for which he is most renowned, are those which deal with national Bohemian folk themes.

For many years he made England the scene of his musical activities, and from 1892 to 1895 held the directorship of the New York National Conservatory. While in the United States he became intensely interested in the music of the negro and the Indian, and introduced their melodies into his symphony *From the New World* and into the overture *In Nature.* Despite the honors heaped upon him in Europe and in America, Dvorak remained to the end the simple man he always had been.

DWARF, a term generally applied to an unusually small human being or to plants and animals greatly below the average size of their species. From the very earliest times dwarfs have received great attention from the scientific world. Ancient kings paid great sums to obtain dwarfs as attendants. In the days of the Pharaohs expeditions were sent into the interior of Africa to procure dwarfs from among the Akka tribe of pygmies. Ptolemy Philadelphus was tutored by Philetas of Cos, grammarian and poet, who was so tiny that his shoes had to be weighted so that he might not be blown away. The Romans valued dwarfs very highly and sometimes adopted artificial means to stunt the growth of children. Julia, the niece of Augustus, was attended by two dwarfs, each twenty-eight inches in height. Jeffery Hudson, famous at the court of Charles I of England, was only eighteen inches high at the age of thirty. His stature eventually increased to thirty-nine inches, and he was so active and intelligent

that he became leader of a cavalry regiment. When only eighteen inches in height he fought a duel with a man who had insulted him, and shot him dead.

In modern times dwarfs are in demand as exhibits. The public is apparently easily attracted by the abnormal, and giants, dwarfs and deformed persons arouse a good deal of morbid curiosity. The most famous dwarf of recent times was known as General Tom Thumb, so called after his prototype, who was supposed to have been a celebrity at the Round Table of King Arthur. There still exist in Central Africa several races of dwarfs perfectly formed, graceful in movement and intelligent. One who is a dwarf need not be mentally deficient. Among white races the dwarf is usually small because of bodily deformity.

DWIGHT, TIMOTHY (1752-1817), an American theologian and one of the ablest of the presidents of Yale College, was born in Northampton, Mass. His father was a merchant, and his mother was the daughter of the renowned Jonathan Edwards. He was graduated at Yale. During the Revolutionary War he was chaplain in the American army; at the close of the war he became principal and pastor of a boy's school in Greenfield, Conn., and in 1795 was chosen president of Yale College, remaining in that position until his death. His accession to the presidency of Yale marked a new era in the history of that institution, as at that time there were only about 100 students, one professor and three tutors, but he established permanent professorships and anticipated the growth of the college by purchasing additional ground. He also planned for the organization of professional schools with special faculties, but only the medical school had been established at the time of his death. His published writings total seven volumes, and consist chiefly of sermons and theological essays.

Timothy Dwight (1828-), a grandson of Timothy Dwight, a noted Greek and Biblical scholar, was born in Norwich, Conn. He was educated at Yale College and in Germany at Bonn and Berlin universities. From 1858 to 1886 he was professor of sacred literature and Greek at Yale, becoming president of the university in the latter year. At the time of his retirement as president in 1899 the student body numbered 2,500. Among his published works are *Memories of Yale Life and Men* and *Thoughts of the Inner Life.* He also annotated several Biblical commentaries and was a frequent contributor to periodicals.

DYAKS, *di'aks,* a race of brown people inhabiting the seacoast and parts of the interior of the island of Borneo. They are of greater stature than the Malays, though considerably shorter than the average white man. Their

A DYAK WOMAN

The clothing for the entire family is made by the women in the above laborious manner. The metal corselet has been a feature of female dress since before white men knew of the Dyaks' existence.

hair is long and straight, and is tied in a knot at the back of the head. Blackened teeth are considered a mark of beauty. Their mouths are generally ill-shaped and disfigured by excessive chewing of betel nut, a habit indulged in by both men and women (see BETEL, subhead *Betel Chewing*). A whole village, consisting of twenty to thirty families, lives together under one roof. This village house is built on piles of wood from six to twelve feet above the ground. Rice cultivation, cloth and mat weaving and boat building are the principal industries. Each family farms its own land.

Head-hunting, or killing human beings and securing their heads as trophies, was long practiced among all the Dyaks, but has been suppressed to a great extent where European influence obtains. In the old days no Dyak chief could be married unless he had been successful in procuring the head of an enemy. For this reason it was usual to make an expedition into an enemy's country before the marriage-feast of any great chief could be held. The head brought home need not be that of a man; a woman's or a child's would serve the purpose quite as well.

DYE'ING AND DYE'STUFFS. Dyeing is the art of permanently coloring textile fabrics and other materials. The term *dyestuffs* is applied to all chemicals and other products used to obtain the desired colors. Dyeing is one of the most ancient of arts. It was practiced in prehistoric times and reached a state of perfection centuries before the Christian Era. The ancient Egyptians employed materials and processes for dyeing similar to those now in operation. As early as 1000 B.C. the city of Tyre was noted for its purple dye, which has not been improved upon by the most modern scientific processes. Cloth dyed with the purple of Tyre was so valuable that the Emperor Diocletian issued an edict in A.D. 301 fixing the price of wool so dyed at $350 per pound. The Greeks and Romans were far behind the ancient Egyptians in knowledge of dyeing, but during the early wars with the barbarians of the north they appear to have altogether lost the art. Julius Caesar found the Britons well skilled in dyeing, using chiefly products of bark and wood.

Dyestuffs. Modern discoveries have to a great extent superseded natural dyestuffs, with the exception of indigo, and most of the commercial dyes are products of coal tar. Animal fabrics, such as wool and silk, are more readily dyed than vegetable products like cotton and flax. The coloring matter quickly adheres to wool and silk, after being prepared by cleaning for the application of the dye. Cotton will not take dye direct, and the coloring matter must be supplemented by some other substance, the action of which tends to make the cotton and the coloring matter combine. There are many substances, called *mordants,* which are used for this purpose. Those most commonly employed are alum, aluminum salts, salts of iron, tannin, albumen and gluten. Stuffs needing mordants are first plunged into a solution of mordant salts and then treated with ammonia, lime, sodium phosphate or sodium arsenate to render the salts insoluble. Then the stuffs are brought into contact with the dye, the resulting color being formed by the combination of the insoluble salts of the mordant with the coloring matter of the dye.

The apparatus used in dyeing is simple in construction, consisting of vats, kettles and cisterns of iron, wood or stone. The water used in washing the fabrics must be pure; any contamination tends to destroy the color effect. Wool, cotton and silk may be dyed before being woven, or may be dyed in the piece after weaving. Mixtures of cotton and wool usually require two dyeing processes. The cotton is first treated, and the finished weave is brought to the required color by a dye that affects only the wool.

German Supremacy. The War of the Nations, which began in 1914, had a serious effect on the manufacture of fabrics in the United States and Canada, owing to the fact that the importation of dyestuffs from Germany, where their manufacture had reached the highest perfection, entirely ceased. Both North and South America had for years relied on Germany and Austria for many of the materials used in dyeing. The German chemists have long been recognized as supreme in this field, and American manufacturers had so far acknowledged this supremacy that home production had been almost entirely neglected. In 1914 only $7,000,000 in dyestuffs were made in the U. S., but the great war cut off German dyes and the industry in America received a great impetus. In 1920 there were manufactured here $54,000,000 worth of natural dyestuffs and extracts, and the business as a whole was declared on a hopeful basis. Hereafter America's needs can be supplied without dependence on foreign markets.

When the supply from Europe was cut off manufacturers were confronted by serious difficulties. Certain colors could not be produced without German dyestuffs. In one case it was necessary for one of Iowa's colleges to change its college colors, as they could not be produced in America. American chemists quickly discovered the secrets of many of the German processes, and produced dyes of good quality, showing conclusively that if the matter had been given earlier attention such utter dependence on the European supply would have been unnecessary. S.L.A.

Related Subjects. The following articles in these volumes contain informaton which will be of interest in connection with the general article on dyeing:

Alizarin	Indigo
Aniline	Mordants
Carmine	Sloe
Coal Tar	Turmeric
Cochineal	Woad

DYNAMICS, *di nam'iks,* from a Greek word meaning *power,* is that branch of physics which treats of the laws of force, or laws of motion. By force we mean that agency by which the rate of motion of a body is increased or decreased or its direction changed. All forces are subject to the same laws. Force is meas-

ured by its effect on a given mass, and two systems or units are used. These are the *foot-pound,* or *poundal* (which see) of the English system, and the *dyne* (which see) of the metric system. In English-speaking countries the metric system is generally used in physical laboratories, and the English system elsewhere. See PHYSICS.

The resistance which a body offers to a force is directly in proportion to its mass. That is, a body weighing four pounds will offer four times the resistance to a given force that a body weighing one pound will offer. This may be expressed in the following law:

The velocity produced in a body free to move without resistance in any unit of time will be directly proportional to the intensity or amount of the impressed force and inversely proportional to the mass of the body.

The science of dynamics is founded almost entirely on the following three principles, known as Newton's Laws of Motion:

(1) A body at rest remains at rest, and a body in motion moves with a uniform velocity in a straight line, unless acted upon by some external force.

(2) A given force will produce the same effect, whether acting upon a body in motion or at rest, whether the body is acted upon by that force alone or by others at the same time.

(3) The action of every force is accompanied by an equal reaction in the opposite direction.

DYNAMITE, *di'na mite,* a word derived from the Greek *dynamis,* meaning *power,* and applied to an explosive substance invented by A. Nobel in 1866. It consists of a mixture of nitroglycerine and some absorbent material such as infusorial earth, wood pulp, guncotton, or mixtures of such materials with nitrates, such as saltpeter. Nobel found that by soaking gunpowder in nitroglycerine an explosive of tremendous power was obtained. Since 1866 the processes for the preparation of dynamite have undergone many modifications. All experiments have been directed toward the production of a dynamite suitable for blasting purposes, combining power with comparative safety in handling.

The most powerful dynamite is now made in the form of gelatin consisting of cellulose nitrate dissolved in nitroglycerine. This is mixed with wood pulp and a little potassium nitrate. The result is a jelly which is easily handled and is suitable for blasting purposes in either dry or wet localities. For commercial purposes dynamite is put up in sticks, or cartridges, eight inches long and from one to three inches thick. The percentage of nitroglycerine varies according to the desired strength. The average dynamite for blasting contains forty per cent of nitroglycerine, but sometimes this is increased to seventy per cent. The dynamite is exploded by means of a fuse and a detonating cap of fulminate of mercury. The explosive force of dynamite is thirteen times as great as that of ordinary gunpowder. It ranks so far below more recently-discovered explosives, however, that except in combination it was little used in the War of the Nations, which began in 1914. See EXPLOSIVES. J.F.S.

DYNAMO, a machine that generates electricity for light, heat, power and other commercial purposes. The name comes from a Greek word meaning *power.* The three essential parts of a dynamo are the *field magnet,* the *armature* and the *commutator.* To understand the construction of a dynamo and the principle upon which it works, one must have some knowledge of electricity, magnetism and mechanics. A brief description to the non-technical mind can at best give an account of only the most important parts and their operation.

Principle of the Dynamo. The principle upon which the dynamo is built is that magnetism generates electricity, and electricity generates magnetism. If a steel bar magnet is thrust into the interior of a coil of wire, a

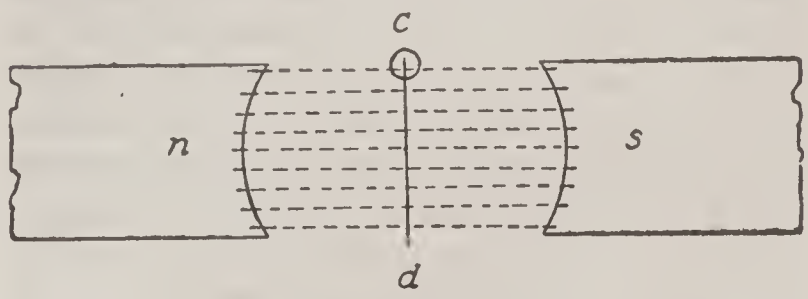


FIG. 1

current of electricity will be generated in the wire. The pressure of this current is greater at one end of the wire and the current will flow continuously in the direction of the least resistance so long as conditions remain unchanged; but if the magnet is turned half way round so as to reverse its poles, the current will flow in the opposite direction. In Fig. 1, *n* and *s* represent the poles of a magnet. The space between them is a field of magnetic force. The wire *c d* is placed at right angles to the lines of this force. If the wire is moved downward the current flows from *d* to *c;* if it is moved upward the current is from *c* to *d.* That is, every time the position of the wire changes in reference to the magnet, the direction of the current changes. If in place of the single wire we use a rectangular wire frame mounted on an axis

so that it can be rotated we shall secure two reversals of the current in the wire at each rotation (Fig. 2). If the ends of this wire are connected by leaders to a galvanometer (which see), this instrument will show that the strength

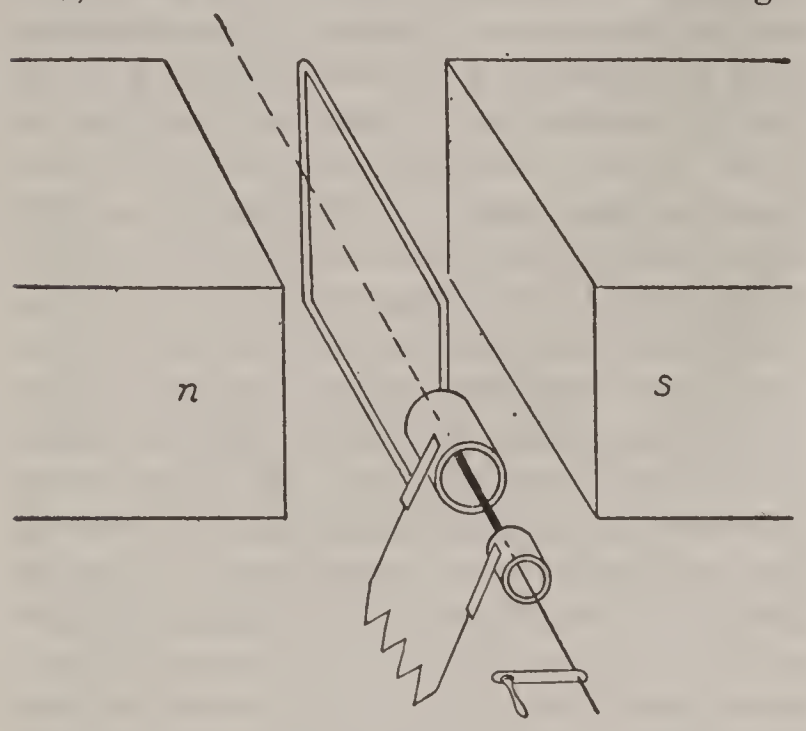


FIG. 2

of the current increases with the rapidity of rotation. Now the dynamo is constructed on this principle. An electro-magnet is used in place of a steel magnet because it can be made so much more powerful.

A Simple Dynamo. Fig. 3 shows a simple dynamo, and one that any ingenious boy can make with a few tools and the aid of a blacksmith. The part *e* is the electro-magnet, on which *n* and *s* represent the + and — poles; *f* is a rotating disk to which two other magnets are attached. This is mounted on the shaft *h*, which is belted from the pulley to a drive wheel. Two brushes, *a* and *b*, are connected with the two insulated copper strips, *r r*, and with the coils of *e* by the wires *l*, *m*.

Iron always possesses some magnetism, which is produced by the work done upon it in preparing it for use. Each magnet generates a current in the other. At first this current is very feeble, but it rapidly gains strength with the rotation of the revolving magnet. At each half revolution of the shaft the relative positions of these insulated copper strips are reversed, and at the same time the currents generated in the revolving magnet are reversed. They pass out by the brush *b* and return through *a*, circulating in this direction through the external circuit and coils of the magnet *e*, as shown by the arrows. The current generated in the revolving magnet is a broken and reversed current, and for this reason is called an *alternating* current, but it is changed to a *direct* or *continuous* current in the coils and external circuit of the permanent magnet.

Parts. The revolving magnet is the *armature,* the stationary magnet is the *magnetic field,* and the insulated pieces of copper form the *commutator,* because by them the alternating current is *commuted,* or changed, to a direct current.

The Commercial Dynamo. Dynamos are unipolar, bi-polar and multi-polar, according to the number of magnets in their magnetic field. Most of those in practical use are multi-polar, and contain as many magnets as can be used. The armature is usually a drum and revolves within the field magnet. The commutator is attached to the shaft of the armature, and brushes connect with the main-line wires.

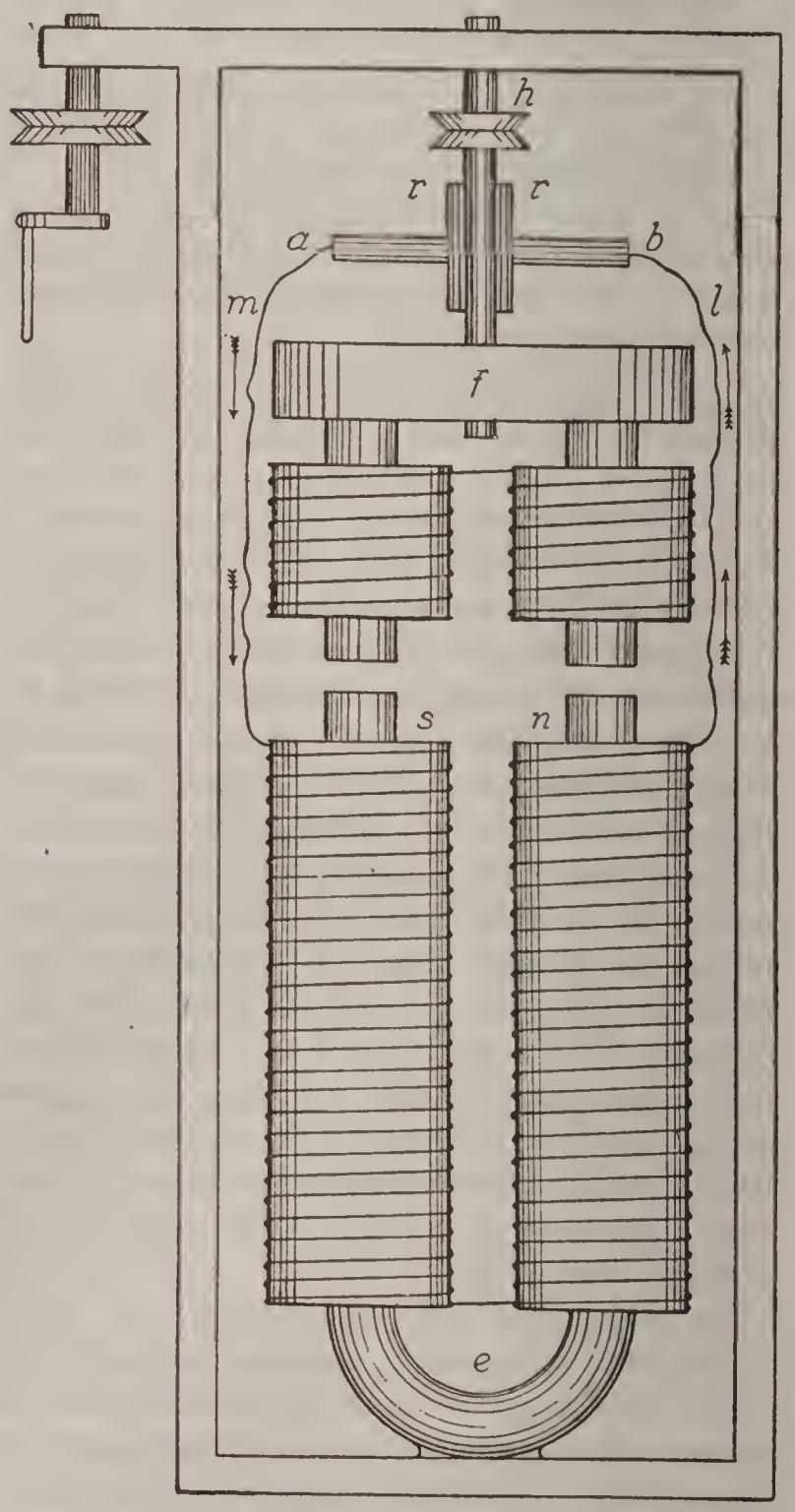


FIG. 3

Dynamos are of two general classes, *alternating current* and *direct current,* and there are many different patterns in each class, but all are based on the principle explained in the

simple dynamo. There are a number of methods of winding the armature and field magnet for the purpose of adapting the dynamo to a particular line of work. Large dynamos are operated by steam engines or by water power. In the best patterns the armature is attached to the shaft of the engine or the water wheel, as the case may be. The steam turbine (see article TURBINE) is used in place of the old-style steam engine in all large electric plants.

Dynamos of 12,000 horse power are in use in New York City. There are a number of 11,000 horse power at Keokuk, Iowa, and those at Niagara Falls are each of 5,000 horse power. Small dynamos from less than one-half horse power are used in small plants (see HORSE POWER).

Uses. The dynamo generates the electric current in use for all commercial and industrial purposes. It lights our streets and houses, bakes our bread, heats our flatirons and sometimes curls women's hair. It furnishes the power for all electric railways, and for operating the powerful machinery of the industrial world. Its invention has so completely changed our methods of manufacture and transportation that we cannot do without it. Without the dynamo the great telegraph and telephone systems of the present day would never have been developed, and wireless telegraphy would have been impossible. W.F.R.

Consult Houston's *The Boy Electrician;* Johnson's *Electricity and Electric Magic.*

Related Subjects. The reader is referred to the following articles in these volumes:

Current, Electric — Electric Light
Electricity — Electromagnetism

DYNE, *dine,* in physics, is a unit employed in measuring force. It is the force which, acting upon one gram of matter, will move it one centimeter per second. In the terms of common weights and measures a dyne is the force which acting upon 15.4 grains of matter will move that mass .3937 of an inch in one second. The dyne is in general use for measuring delicate electric force, but the unit is too small for ordinary purposes. For larger measurements the megadyne (1,000,000 dynes) and the kilogram (1,000,000 grains) are used. In physics the dyne is considered as the unit in the centimeter-gram-second (C. G. S.) system of units. See METRIC SYSTEM; DYNAMICS.

DYSPEPSIA, *dis pep' si a,* a term generally used to describe indigestion in any of its forms. The word is derived from the Greek *dus,* meaning *hard,* and *peptein,* meaning *to digest.* Dyspepsia may be caused by eating food which is not readily digestible, by overindulgence in any kind of food, by bolting the food, by eating too concentrated foods, by unbalanced diet or by irregularity of meals. Another frequent cause is found in bad teeth, which prevent proper mastication of food. The symptoms are many and varied. A feeling of weight in the stomach, flatulence, headache or drowsiness are common symptoms. It may be, and frequently is, accompanied by constipation. A cure can be effected only by removing the cause. Out-of-door exercise is of great importance, and plenty of sleep in a well-ventilated room is essential. Medicinal treatment is never so effective as careful self-management. Regular habits should be cultivated, and the stomach should never be overfilled by too hearty meals. It is essential that the food be thoroughly ground by the teeth and mixed with saliva before it leaves the mouth (see MASTICATION).

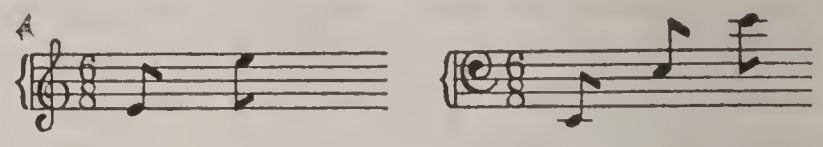
The advice of physicians, very difficult for most people to accept, is that one should stop eating a little before his appetite appears fully satisfied. Greasy foods, smoked or salted meats, salt fish, pastry and newly-made bread should be avoided. Hot or cold water should be partaken of freely on arising in the morning, and from one to two glasses of hot water should be drunk an hour or so before lunch and before dinner. No fluids should be drunk by the dyspeptic at meal time, and tea can well be dispensed with altogether.

Dyspepsia is frequently a symptom of disease in the abdomen elsewhere than in the stomach. W.A.E.

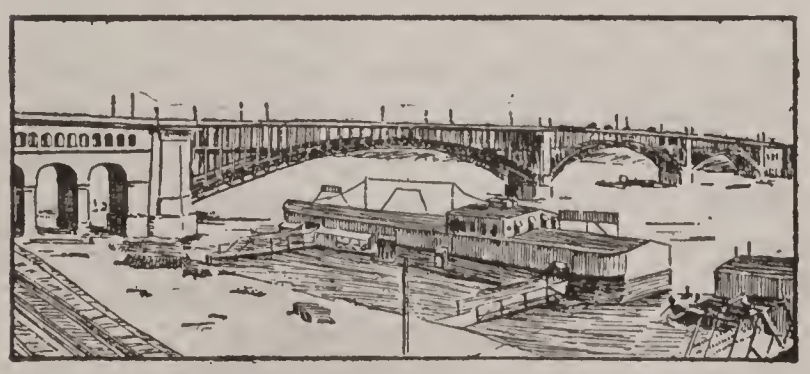
Ee

E, the fifth letter of the English alphabet and the one oftener used than any other. The Phoenician letter, which in form corresponded to it, represented a window and was an aspirate, such as expressed in the English *h,* but the Greeks made use of it as a vowel. They also turned it around from left to right, almost like the English capital letter *E,* which has come down from it. Like the letter *a,* it represents a number of sounds, the short sound being common in such words as *met, bless.* The long sound is the natural sound of the letter, as in *eve.* It was first in the fifteenth century that the final *e* in a word was not pronounced; it served and still serves to give the preceding vowel a long sound, as in *cane* or *mane.* The frequent use of the letter in English is largely due to its being the indefinite vowel into which the *a, o, u* endings of the Anglo-Saxon period were weakened. See ORTHOGRAPHY.

In music *E* is the third note in the natural scale of *C.* In the G clef *E* is on the first line and fourth space.



EADS, *eedz,* JAMES BUCHANAN (1820-1887), an American engineer who designed and constructed one of the finest bridges in the world, the *Eads Bridge,* arched over the Mississippi River at Saint Louis. He was born at Lawrenceburg, Ind., but at an early age went to Saint Louis and became a clerk on a steamboat. He invented a diving bell boat and an apparatus for raising sunken boats. Becoming famous as an authority on all matters relating to the navigation of the Mississippi, he was asked for advice by President Lincoln at the time of the War of Secession; the fleet of gunboats built on his suggestion rendered valuable service to the government, and with them Fort Henry was captured in 1862.



THE EADS BRIDGE

Among other improvements promoted by Eads along the Mississippi River, most notable is the construction of jetties (see JETTY) at the mouth of the Mississippi, permitting navigation by the largest ocean-going vessels. He was the first American to receive the Albert medal, conferred by the British Society for the encouragement of arts, manufactures and commerce.

The Eads Bridge is a three-span, steel-arched bridge connecting Saint Louis, Mo., and East Saint Louis, Ill. Four great piers standing on bed rock far below the river bottom support a bridge which accommodates two railways and a broad highway for street-cars, teams and pedestrians. This structure, erected without interfering with the river traffic, cost $6,500,000, about seven years' work and thirteen lives; but the difficulties encountered and overcome inspired men to inventions, ideas and methods of marked value to subsequent bridge engineering. It is not a free bridge, toll being required of all who use it, in the sums of twenty-five cents for persons on trains, ten cents for street-car passengers, and five cents for foot passengers. This great bridge was begun in 1867 and completed in 1874.

EAGLE, *e'g'l,* a general name for several species of birds of prey, widely distributed in both the eastern and western hemispheres. In the popular mind the name is associated with a bird of superb strength, keenness of sight

He clasps the crag with hookéd hands;
Close to the sun in lonely lands,
Ring'd with the azure world, he stands.
TENNYSON: *The Eagle.*

and marvelous powers of flight. This is the "bird of the broad and sweeping wing," as Percival describes it in his poem *To the Eagle*—a bird typical of strength and courage, which majestically soars higher than any other creature of the air and nests on mountain crags.

As a matter of fact, the different species of this group of birds vary considerably in size, appearance and characteristics, and not all of these deserve the halo of romance and poetry that has become so popularly associated with the name eagle. In general these birds possess a great powerful bill, with its upper part, or *mandible,* curved sharply down over the lower, toes with strong grasping power, and sharp, curved claws, or talons, used for seizing their prey. In most species the legs are feathered to the toes.

The Golden Eagle, a species common throughout mountainous and unsettled regions of North America, Europe, Asia and Northern Africa. It measures about seven feet from tip to tip of the expanded wings, and over three feet from beak to the end of the tail. Its body plumage is dusky brown, but the back of the head and the nape are pale yellow, whence its name, and the basal half of each tail feather and the feathers on the legs are white. Its favorite nesting place is a mountain tree or rocky cliff; the nests, some of which are fully five feet in diameter, contain two to three dull white eggs, which are often speckled or blotched with brown. This bird is a robber of lambs from the sheepfold, but is unjustly accused of carrying away young children to its distant eyrie. Called by some the *mountain eagle,* it is best known in Western North America as the *war eagle,* because its tail feathers are the favorite plumage for the Indians' war bonnets. These birds "grow gray with age," and may live a century.

The Bald Eagle, also known as the *Washington,* or *American, eagle,* is the one which has been chosen as the national emblem of the United States. The figure of this eagle is found on gold coins issued by the government. Its name has reference to the white head and neck of the mature bird. The year-old bird is dark brown; during the second year its plumage turns gray, and in the third year it becomes dusky brown, with head, neck and tail white, bill and feet yellow and the lower part of the legs bare of feathers. This eagle is particularly fond of fish and often robs the fishing osprey of its lawful prey. It feeds, too, on any small animals it can capture. Its habitat is the temperate regions of North America, and its favorite nesting place a tall tree near the water, though sometimes it nests on the rocky ledge of a high cliff. The eyrie is four or five feet in width, and is often as high as it is wide. The bald eagle lays two or three dull white eggs, somewhat like those of the golden eagle, but unblotched.

Other Species. Among other species in different parts of the world are the powerful *buzzard eagles,* the *Guiana eagles* of South America, and the huge *harpy eagles* of Brazilian forests. See HARPY; LAMMERGEIER. Compare, also, CONDOR. E.T.S.

Eagle (AS A STANDARD). Among the early Romans a gold figure of an eagle, symbol of strength and prowess, was placed on the tip end of a spear and carried as a standard at the head of a legion. Figures of animals were used, too, but in 104 B.C. the eagle became their chief emblem. Next to the lion, it became after the thirteenth century the favorite

device of knights and royalty on shields and armor. It was adopted by the German emperors, who claimed to be the successors of the Caesars. The double-headed eagle is used on the Russian and Austrian coats-of-arms, and in

THE EAGLE AS AN EMBLEM
In the center, the eagle of the Roman legions. At left, Austrian and Prussian symbols; at right, Russian and French.

1782 the United States adopted as its emblem the eagle with outspread wings, a shield on its breast, holding an olive branch and a sheaf of arrows in its talons. In the beak of the eagle in the American coat-of-arms is a scroll on which are the words *E Pluribus Unum,* the national motto of the American Union, meaning *from many, one.*

EAGLE. In the United States a gold coin worth ten dollars is issued by the government, and because it has the head of an eagle stamped on the back, the coin has been called an eagle. Its weight is 258 grains, nine-tenths pure gold. Eagles were first coined in 1795. Half-eagles, quarter-eagles and double-eagles are also coined. The value of the eagle and other gold pieces is the sum stamped on them, unless a considerable part of the gold is worn off by use, for the gold alone, without the added hardening metal, is of that value. See ALLOY; MONEY.

EAMES, *aymz,* EMMA, the stage name of EMMA HAYDEN STORY (1867-), an American soprano who has reached a high place in the world of grand opera. She was born in Shanghai, China, of American parents, and after the return of the family to America in 1872 her musical career was given careful attention. She studied in Boston and in Paris, and in 1889 made her début as Juliet at the Grand Opera, Paris, after which, in rôles such as Aïda, Elisabeth, Sieglinde and Santuzza, she gained remarkable success in all parts of the world. She married the artist, Julian Story, in 1891, but was divorced from him in 1907 and in 1911 married the baritone, Emilio de Gogorza.

EAR, a device for receiving air vibrations that produce sound, and for transmitting them to the auditory nerve. The human ear is an example of perfection and delicacy of structure not surpassed elsewhere in the body. It consists of three parts, the *external ear,* the *middle ear* and the *internal ear.*

The External Ear. The external ear consists of two parts, the outer visible part, called the *auricle,* or *pinna,* and the *auditory canal,* a tube about one and one-fourth inches long, leading from the auricle to the membrane of the middle ear. The auricle, the part usually called the ear, is composed almost entirely of skin and cartilage, and, with rare exception, is stationary. Traces of muscles attached to the ear lead anatomists to believe that these muscles were once active and that there was a time in the development of the human race when man could move his ears to some extent to catch sound waves, as do horses and some other animals. The large hollow portion of the auricle, at the base of which is the opening into the auditory canal, is called the *concha,* from its fancied resemblance to a conch shell.

The Middle Ear, or Tympanum. The middle ear is a small cavity in the temporal bone, half an inch long and a quarter of an inch wide. In popular language it is known as the *drum cavity,* for its outer end is closed, like a drum, with a thin piece of membrane (*membrana tympani*). This membrane separates the drum cavity from the external ear, while a bony-membranous partition forms a common wall for the middle and inner ears. The middle ear is filled with air and lined with mucous membrane, and its cavity extends backward into a bony projection known as the *mastoid process.* Extending across the cavity from one membrane to the other is a chain of three small bones—the mallet (*malleus*), anvil (*incus*) and stirrup (*stapes*). See *a, b, c,* Fig. 2. The mallet consists of a head, neck and handle, the latter being attached to the inner surface of the drum membrane. The bones are so joined together that they strengthen the vibrations of the ear drum as they carry them forward to the internal ear.

The membrane of the tympanum is nearly circular and about two-thirds of the size of a

ten-cent piece. It is placed obliquely across the auditory canal, and consists of fine, fibrous tissue covered on the outer surface with a thin layer of modified skin and on the inner with a delicate mucous membrane. Air is admitted to the middle ear through the Eustachian tube, which opens into the throat behind the soft palate. Through the Eustachian tube an equal atmospheric pressure is maintained on each side of the drum membrane. Sometimes this balance is disturbed by forcing an extra bubble of air into the middle ear when one is coughing or sneezing; an uncomfortable sensation is then experienced, and the hearing is affected for a moment. Children often force air into the middle ear by holding the nose and closing the mouth and then trying to expel the breath. The practice should be discouraged, as it may cause injury to the ear drum. In the act of swallowing the tube is opened, allowing an interchange of air and adjustment of pressure. This fact is important for those who ascend in airships or go down in diving bells.

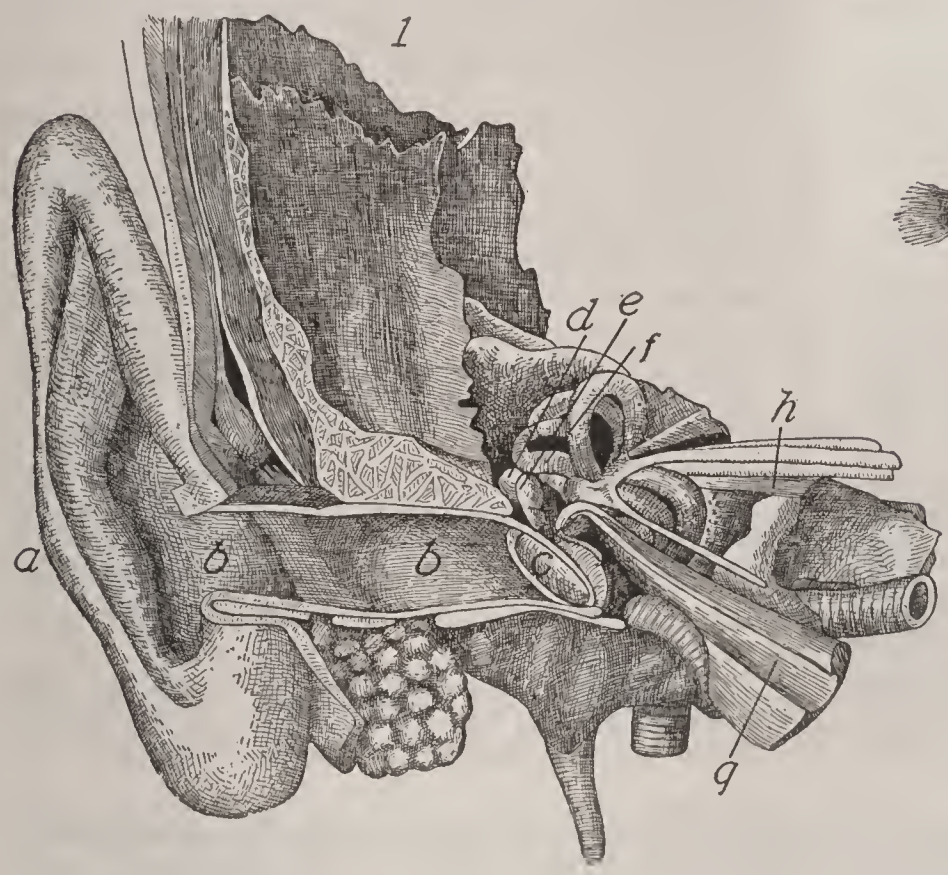
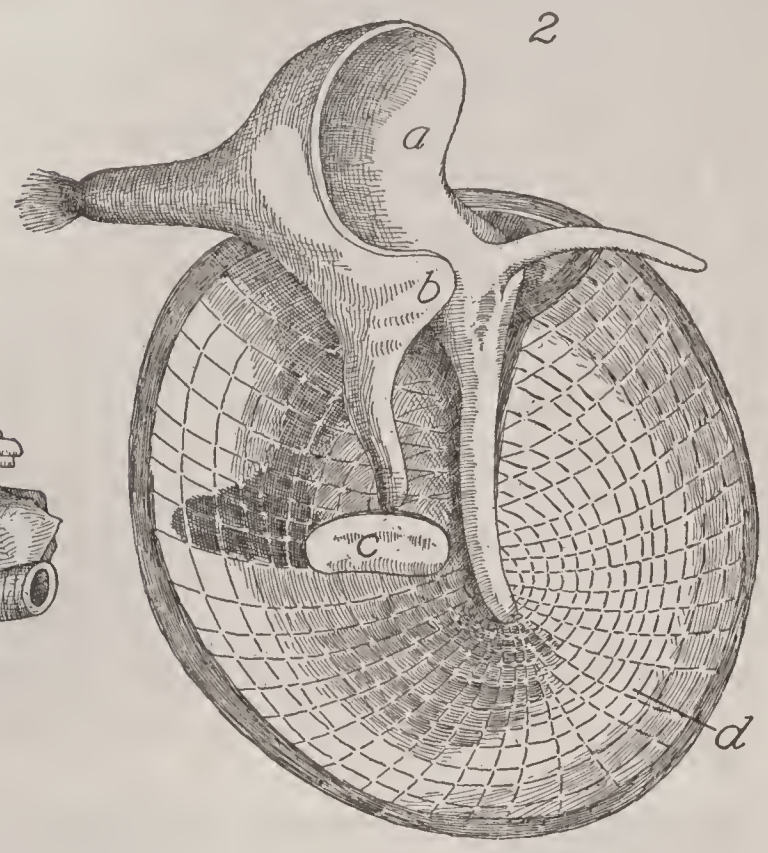


Fig. 1.
(*a*) Pinna, or auricle
(*b*) External auditory canal
(*c*) *Membrana tympani*
(*d*) Incus
(*e*) Malleus
(*f*) External semi-circular canal

The Internal Ear, or Labyrinth. The internal ear is a cavity having the form of a three-sided pyramid, with walls and partitions of very hard, compact bone. Because of its numerous winding passages, it is often called the *labyrinth*. It consists of three parts, the *vestibule*, the *semicircular canals* and the *cochlea*.

The Vestibule. The vestibule is a small ovoid-shaped cavity between the cochlea and the *semicircular canals* and the *cochlea*.
entire hearing apparatus. The base of the stirrup, or *stapes* bone, is set into an opening in the front wall, and there are openings in the other walls leading to each of the semicircular canals and to the cochlea. Through minute openings in its inner wall filaments of the auditory nerve enter.



(*a*) Head of the malleus
(*b*) Incus
(*c*) Plate of the stapes
(*d*) Insertion of the *tensor tympani*
(*g*) Eustachian tube
(*h*) Internal auditory canal

Fig. 2.

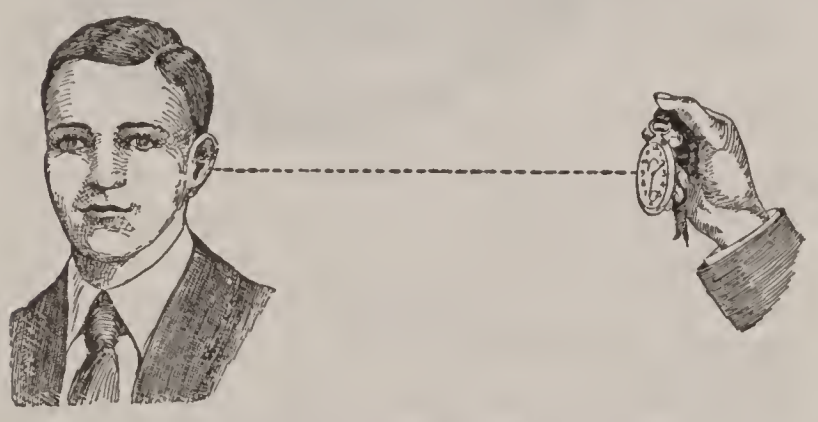
The Cochlea. This little organ, shaped somewhat like a snail-shell, from which it takes its name, is situated in front of the vestibule. In its center is a bonelike column, around which a spiral canal winds two and a half turns. At the top this canal is closed, but at the bottom there are two openings, one of which leads to the vestibule.

Semicircular Canals. These are three in number; two are in a vertical position and one is horizontal. The vertical canals are placed at nearly right angles to each other, one being in a plane extending from front to back and the other one extending from side to side. It is now generally believed that these canals do not aid the sense of hearing, but that, strange as it may seem, their function is to enable a

person to keep his balance. Nerves extend from them to the cerebellum, communicating there with the nerves controlling the muscles that enable one to stand. Any movement which causes violent or unusual disturbance of the liquid in these canals leads to dizziness, which in turn may cause nausea. Seasickness is caused by this sort of disturbance.

The Membranous Labyrinth. Within the cavities of the internal ear and separated from the bone by a layer of liquid (*perilymph*) is a membranous sac which in form and size coincides almost exactly with them. To this the name *membranous labyrinth* has been applied. This sac is filled with fluid (*endolymph*) in which are found minute threadlike branches of the auditory nerve.

The Organ of Corti. The cochlea is divided into two parts, nearly equal in size, by what is known as the *basilar membrane.* Supported on this is a wonderful structure named, from its discoverer, the *organ of Corti.* It is formed



ONE TEST OF HEARING

This can be comparative only as between two or more people with the same watch. A maximum distance from ear to watch is not easy to suggest, for some watches tick more loudly than others. This test with any time-piece, however, will always demonstrate whether the hearing of one person is more acute than that of another.

of rods and cells which are continued with the basilar membrane throughout the extent of the cochlea. This organ and the membrane constitute a series of vibrating cords provided with nerve apparatus for receiving vibrations which are transmitted from the bones of the ear through the endolymph. These vibrations in turn are transformed into nervous impulses. The cords of the membrane are so adjusted that they can respond to vibrations which vary in rapidity from thirty to about 20,000 each second. The particular part that the organ of Corti plays in the process of hearing is further explained in the subhead below, *How We Hear.*

How We Hear. The act of hearing consists of two parts, one physical and the other mental. The apparatus which is described above is for the physical part. That for the mental part is found in the auditory centers of the brain, where the sound impressions conveyed by the auditory nerves are perceived and analyzed. To understand how the ear works, one must be acquainted with the laws of sound. These are explained in the article SOUND (which see). This article treats only of the reaction of the ear to sound waves.

A bell rings in an adjoining room. How do you hear it?

1. The tone sent forth is produced by vibrations in the metal of which the bell is made.
2. These vibrations set up vibrations, or waves, in the air, some of which enter the auditory canal and strike upon the drum membrane.
3. The waves striking upon the drum membrane set it to vibrating.
4. These vibrations are carried by the bones of the middle ear to the vestibule, where they set up vibrations in the fluid of the internal ear. The rods in the organ of Corti reproduce these vibrations and excite the auditory nerve, which carries the impression to the auditory centers of the brain.
5. The auditory centers react; that is, they bring the mind to bear on the impression they have received, and you hear the bell.

To obtain an illustration of the the principle upon which the organi of Corti works, stand beside a piano with the lid open, and sing a clear, strong note; then listen, and you will hear the note reproduced by the piano. This is because some wire in the instrument produces the same number of vibrations per second as were produced by the voice. The other wires are silent because they cannot produce this same number of vibrations. The organ of Corti may be likened to a piano with many wires, each selecting the tone it can produce.

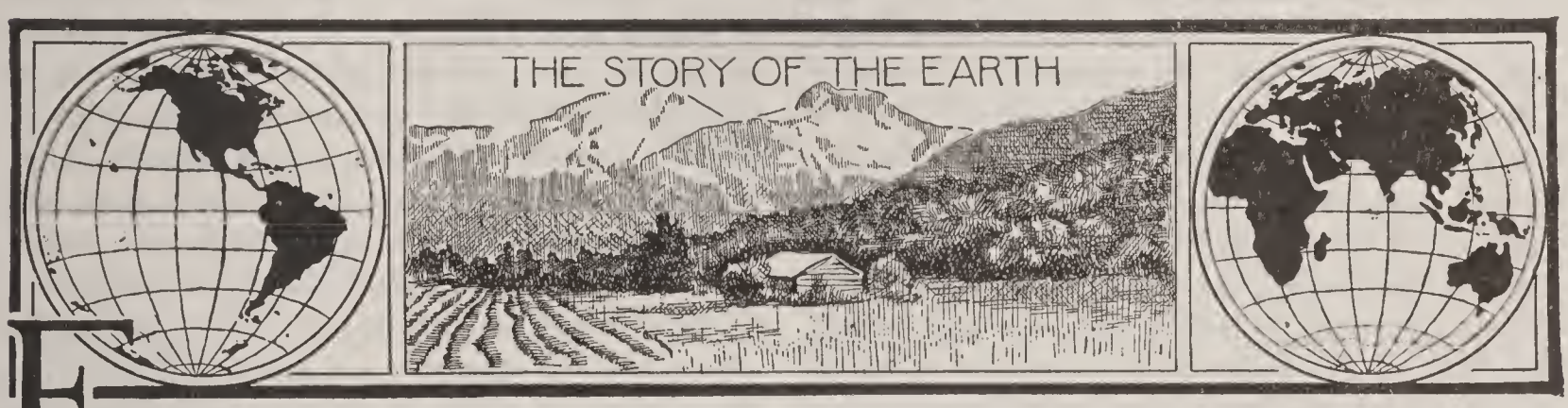
Care of the Ear. The skin of the auditory canal contains cells that pour into the canal a yellowish substance called *ear wax,* which has a very bitter taste. Its purpose is to protect the ear by catching any dirt that may get into the ear, and to repel insects. The wax dries and scales off and carries foreign substances with it. It should not be removed from the canal except when it accumulates in excess. The ear drum has a very delicate membrane, which is easily punctured or broken. A severe blow upon the ear may break this membrane and render the victim deaf for life; therefore "boxing the ears" of children is a dangerous punishment. Neither should one stick pens or pencils into the ear. It is safe to follow the old German proverb, "Never pick your ear with anything smaller than your elbow." Any foreign substance in the ear should be removed by a physician.

If the internal ear is injured or any part of it is destroyed there is no remedy, and this is also true of the auditory centers. Injury to any of these parts may render a person deaf. Consequently, earache, due to the formation of abscesses in or about the ear, should receive prompt attention from a physician. The ear is a most delicate organ and must be treated with care. See DEAF AND DUMB. J.H.K.

Consult Dench's *Diseases of the Ear;* Cunningham's *Text-book of Anatomy.*

EARL, *url,* the oldest title of nobility and third in rank in the British peerage, marquis and duke being more exalted titles. It was the highest title until the Black Prince was made Duke of Cornwall in 1337. The word is derived from the Scandinavian *jarl,* and was in use in England as early as the days of Canute. An earl is addressed verbally as "My Lord" and in writing as "The Right Honorable, the Earl of ————." An earl's wife is a *countess* and is addressed as "My Lady" and "Right Honorable." The eldest son is called *viscount* by courtesy, all younger sons being styled "Honorable." The daughter of an earl is entitled to have "Lady" prefixed to her Christian name.

EARLY, *ur'li,* JUBAL ANDERSON (1816-1894), a prominent Confederate general in the War of Secession, was born in Franklin County, Va. He was graduated at West Point in 1837 and was appointed lieutenant of artillery, but resigned in order to study and practice law, and was afterward elected to the Virginia legislature. He opposed secession of the Southern states of the American Union, but after Virginia joined the Confederacy he entered the army on the side of the South and rendered conspicuous service at the first Battle of Bull Run, soon after being promoted to the rank of brigadier-general and subsequently major-general. After Lee and Jackson, General Early was regarded as one of the ablest in the Confederate army. At the close of the war he went to Canada, but returned to the United States to resume the practice of law in 1867. For a time he was president of the Southern Historical Society. He died in Lynchburg, Va.



EARTH, *urth,* a member of the solar system, the planet inhabited by man, third among the planets in distance from the sun, Venus and Mercury being nearer. It is attended by one satellite, the moon. The component parts of the earth are a gaseous *atmosphere* enveloping the earth's crust; the solid surface, called the *lithosphere;* the surface waters, called oceans, or the *hydrosphere;* and the *centrosphere,* the interior, or nucleus, of the earth itself.

To account for the origin of the earth many theories have been advanced, both in ancient and in modern times. The best-known of the explanations offered by modern scientists is the nebular hypothesis of Kant and Laplace. The earth, according to this theory, is a part of a system which was originally a body of gaseous (nebulous) matter. Under the action of the force of gravity this matter tended to take a rotating globular form. As the mass gradually contracted parts of it were thrown off, one after another, forming the earth and the other planets. Likewise the rapid rotation of the planets caused portions of their masses to be thrown off, forming the satellites.

The nebular hypothesis is not, however, accepted by all scholars, and in fact is giving way to the newer *planetesimal hypothesis.* The scientists who accept this theory believe that nebulae consist of swarms of small bodies, many of which move in regular paths and are really tiny planets, whence the name planetesimal. It is supposed that some of these revolving bodies are brought so close to one another that they are gradually collected into a number of large, compact masses, heat and pressure combining to weld together the separate parts of these masses. Continuing to revolve around the central sun, they gather up other planetesimals and so form planets. The origin of our solar system and of others is

explained by this hypothesis, which, its sponsors say, overcomes various difficulties of the Laplace system.

Form of the Earth. Though in popular language the earth is said to be round, like a ball, it is really an irregular sphere, slightly flattened at the poles. For lack of a better word, geographers call it a *geoid;* this word is of Greek derivation and means *earthlike.* The slight departure from rotundity is accounted for by the rapid motion of the earth while in a more plastic state. Because of the flattening at the poles the diameter of the earth from pole to pole through the equator is shorter than that at the equator. The meter, the unit of linear measure in the French, or metric, system, is exactly one-ten-millionth of the distance from equator to pole.

The belief of the ancients concerning the shape of the earth is one that prevailed for many centuries before Columbus made his epoch-making voyage in 1492. Ancient people, as do primitive races of to-day, believed that the earth was a flat disk of land, floating on water beneath a huge inverted bowl of sky which met the water at a distance beyond the measurement of man. So persistently was this belief held that the first expedition of Columbus was considered by large numbers of people as not only ridiculous but highly dangerous; his vessels, they said, were sure to fall off the earth if they sailed far enough.

It is not true, however, that no one before the days of Columbus knew that the earth is round. That fact had been proved before the time of Aristotle (d. 322 B.C.), and Aristotle himself figured the circumference of the earth at 40,000 miles. A more accurate estimate was made by Eratosthenes, a Greek of Alexandria, in 200 B.C.; he figured it to be 25,000 miles, which is only 101 miles more than the exact distance. During the Middle Ages, however, the knowledge of the earth's rotundity seems to have been lost altogether; it was during the exploration era, which began in the closing years of the fifteenth century, that the fact was proved beyond all doubt and became a permanently-established principle of geography. The arguments that are advanced—the disappearance first of the hull of a vessel as it sails away from harbor, the appearance of the top mast first as it approaches harbor, the circular shadow thrown on the moon by the earth in times of eclipse—have their culmination in the greatest argument of all, that men have actually sailed around the earth.

Parts of the Earth. Returning to the division of the earth into its component parts, the first to be considered is *atmosphere,* or air. By means of atmosphere all plant and animal life is sustained, for both plants and animals breathe. The atmosphere envelops the globe in the form of an intangible, invisible outer covering. Its depth is not known, but we know that it is at least 100 miles, although at that height it is not at all dense. When people were first told that the earth is traveling through space at the enormous pace of 66,000 miles an hour in its journey round the sun, they believed that if that were true the world would run away from its air. They did not realize that the atmosphere was an integral part of the earth's system, enveloping it completely and traveling with it on its endless journey.

The atmosphere bears on the surface of the earth with a pressure equal to 14.7 pounds per square inch; that is, a column of air with a base of one square inch reaching as high as the atmosphere extends weighs 14.7 pounds. Its average thickness is believed to be about as stated above, but it is so much denser near the earth that half its bulk is within two and one-half miles of the earth's surface. This is readily proved by those who ascend high mountains; the higher the climber goes the more rarefied and the lighter the air grows, until breathing becomes a matter of difficulty, as there is not enough density or weight in the atmosphere to satisfy the lungs. Aviators who fly at extreme heights suffer greatly from this cause.

The Solid Crust, or Lithosphere. Under the title lithosphere is to be considered the outer crust of the earth, the shell which encloses the nucleus of the earth. It is from this shell that we derive our means of sustenance, on which we grow crops, from which we extract gold, coal, iron, and other valuable commodities. It is estimated that the crust of the earth consists of a mass of solid matter whose volume is approximately 1,677,000,000 cubic miles. Such a mass is entirely beyond human comprehension, and worked out into tons would be represented by 210 followed by eighteen noughts. The average volume of the earth's crust has a density of 5.5 times that of water. The earth contains a great store of heat which, even in the outer crust, causes an increase in temperature in mines and wells of 1° F. for every sixty feet of descent. The depth to which the crust has been penetrated is com-

paratively slight, the deepest mine in the world not exceeding 6,000 feet, a little over a mile. This depth, however, is sufficient to raise the temperature almost beyond the point of human endurance. Scientific ventilation counteracts the increase in heat and renders it safe for men to work even at such a depth.

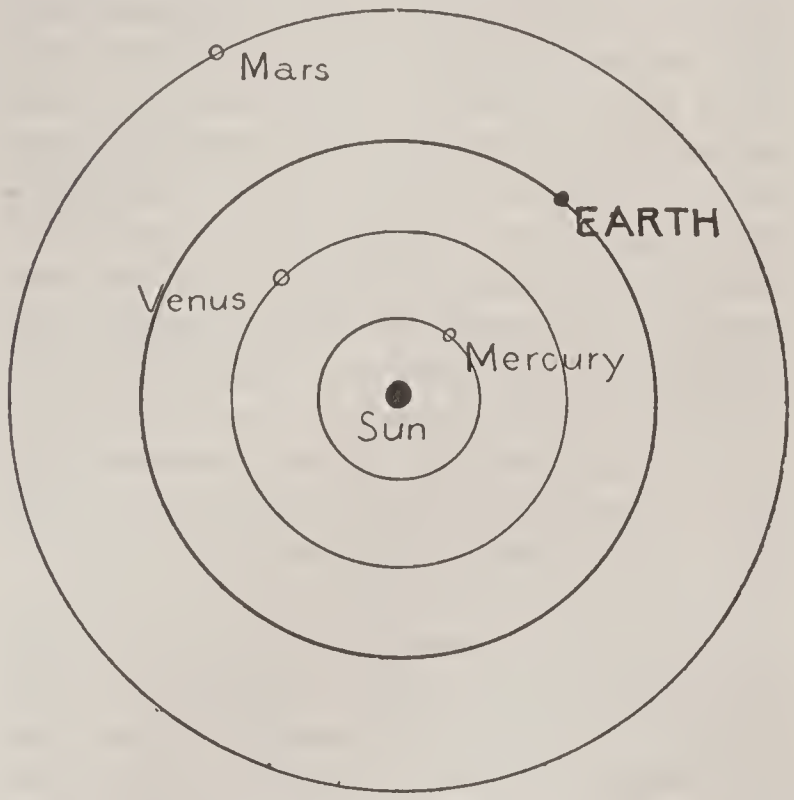
The Oceans, or Hydrosphere. About three-fourths of the earth's surface is covered by water—oceans and seas. The average depth of the oceans is about two miles; thus the volume of the oceans is 315,000,000 cubic miles. This is about $\frac{1}{800}$ part of the entire volume of the earth. The earth's crust, covering the earth to a depth of several miles, and of greater density, has a mass of about fourteen times that of the oceans.

The Interior, or Centrosphere. Exactly what the center, or nucleus, of the earth is composed of, opinions vary; scientists have brought forth many theories. One thing clearly established is that the density of the interior, or core, of the earth is greater than that of the earth's crust which rests on it. Some scientists maintain that the center of the earth is a molten mass, while others claim that this cannot be true, as the pressure of the crust on the nucleus, or center, is so great that heat far above the ordinary melting point can be resisted under such pressure. Increase the pressure on iron and the temperature of the melting point rises; thus, it is argued, the interior of the earth may hold sufficient heat to melt any metal at the surface, but not sufficient to melt it under the pressure of countless millions of tons of the earth's crust. An eminent English scientist maintains that the earth is solid throughout, rigid, but containing gaseous outlets or flaws here and there which, by reducing pressure, permit volcanic escapes and melting of matter which under pressure has remained solid. From the amount of pressure it is probable that such flaws cannot exist at a depth of more than a few miles; so the theory of an entirely solid nucleus finds wide acceptance among scientists.

The heat from the center of the earth continually escapes through the crust in appreciable quantities. It is estimated that the escaping heat would be sufficient to melt a coating of one-fourth inch of ice all over the world, or 800 cubic miles of ice every year. That the earth is shrinking as this heat escapes is a theory advanced by many scientists, but it would take thousands of millions of years to shrink to any appreciable extent.

Weight of the Earth. Archimedes, the famous Greek mathematician, was so proud of his invention of the lever that he exclaimed, "Give me a place to stand on, and I will lift the earth." At first thought, the task of the man who would undertake to weigh the earth would appear to be hopeless. Yet the earth has been weighed, not by putting it in the scales, but by scientific calculations which are equally certain in their results. The first calculations of the earth's weight were made by observing how much the attraction of a mountain caused a plummet to vary. The mountain could be measured and the weight calculated. From the proportion of the mass of the mountain to the earth, the weight of the earth was calculated, the result being expressed in figures absolutely beyond human comprehension. The figures in the table at the end of this article accord with scientific belief.

Motions of the Earth. *The Annual Revolution.* In common with all planets belonging to the solar system the earth moves round the sun and rotates on its own axis at the same time. Its revolution round the sun is completed in about 365¼ days, our common year; the precise time is 365 days, 9 hours, 9 minutes, 9.3 seconds, this time being known as the *sidereal* year. The path of the earth being an ellipse, with the sun as one of its foci (see Focus), the globe is not equally distant from the sun at all times of the year. Its least distance from the sun is 89,897,000 miles; its greatest distance, 92,963,000, generally expressed in round numbers as about 93 millions of miles. The earth travels around the sun at a speed



Orbit of the earth and of the three other "inner planets."

of about nineteen miles per second; so smooth is the motion through space and so slight are the variations of the earth's surface in proportion to its mass that no billiard ball has ever yet been made with less proportionate deviation from perfectly "true" motion.

The earth is nearest to the sun when it is winter in the northern hemisphere; when it is summer, farthest away from it. This at first appears improbable, yet it is true. It is not the distance from the sun that produces cold; the oblique direction of the sun's rays in winter, due to inclination of the earth's axis, prevents the radiation of heat over the northern surface. From the earth it appears as though the sun were also describing a similar circular path through the heavens. Hence it is that one group of stars is found near the sun at one time, and another group is near it at another date. The earth's position and point of view have changed, however, for the sun remains stationary.

Daily Rotation of the Earth. In 23 hours, 56 minutes, 4.1 seconds the earth makes a complete rotation on its own axis, this axis being inclined to the plane of its path about the sun at an angle of 23½°. In this rotation on the axis a person at either Pole would not move, but at the equator he would be whirled safely through space at the rate of about 1,000 miles per hour, for the equatorial circumference is nearly 25,000 miles. The motion of the earth causes the sun apparently to rise towards the North Pole from March 21 to June 21, until it is 23½° above the equator; to descend towards the equator from June 21 to September 21; then it commences to sink toward the South Pole, and to return to the equator about March 21, the vernal equinox.

This apparent motion of the sun, in reality the motion of the earth, is the cause of the changes in seasons, the lengths of day and night and the rising and setting of the sun. Countries lying north or south of the equator have equal days and nights twice a year, at the equinox. The earth is divided by imaginary lines into climatic zones, or regions. Within the limits of 23½° of the North and South poles are the *Arctic* and *Antarctic* circles; within 23½° on each side of the equator lie the tropics of Cancer and Capricorn, embracing the *torrid zone*. Between the tropics and the polar circles lie the north and south *temperate zones*, the area of the world's culture and the theater wherein all man's greatness has been achieved.

The Earth as a Clock. No mechanical appliance for time-keeping has yet been invented which can compete with the earth in the unfailing regularity of its motions. Although the earth is subject to influence of gravity from the other planets which might cause variation, such a change has never been noted to any appreciable extent, and it would take probably more than twenty centuries to alter the time-keeping qualities of the earth sufficiently to attain a result capable of expression in fractions of a second. Such is the poetic "harmony of the spheres."

At exactly the noon hour, when the sun is on the meridian at Greenwich Observatory, the time is flashed all over Europe; in Washington the time ball falls at the instant of noon from the tower of the naval observatory, and the telegraph announces the time.

Magnetism. One of the most striking features presented by the earth as a whole is its magnetism. The earth is one huge magnet and has two magnetic poles, which, although near the geographical poles, do not coincide with them. The north magnetic pole was located in 1905. The action of the earth as a magnet is seen when a magnetic needle, balanced on a point, remains in one position, pointing nearly due north and south. On this principle the compass, which renders world navigation possible, is based.

Some Computations. Scientists agree quite well, in spite of the immensity of their task, on certain mathematical facts relating to the earth. The circumference and diameter are known and measured with astronomical instruments to within less than one-fourth of a mile. One proof that the earth is slightly flattened at the poles is that at Edinburgh, Scotland, a degree is longer than in the vicinity of Madras.

Diameter of earth at equator (miles)	7,926.592
Diameter through the poles (miles)	7,899.739
Circumference at equator (miles)	24,899.00
Area of land surface (square miles)	55,641,102.
Area of oceans and seas (square miles)	141,333,882.
Total of the earth's surface (square miles)	196,974,984.
Weight of earth and atmosphere (tons)	3,333,112,909,800,000,000.
Proportionate density of water and solid matter	1 to 5.5
Nearest approach to the sun (miles)	89,897,000.
Farthest distance from the sun (miles)	92,963,000.
Length of a degree of latitude at poles (miles)	69.407

Length of a degree of latitude at equator (miles) 68.704
Cubic contents of earth (cubic miles) .....259,914,035,515.

J.R.

Consult Reade's *The Evolution of Earth Structure;* Bonney's *The Story of Our Planet.*

Related Subjects. For age of the earth, see GEOLOGY; for manner of reckoning time, LONGITUDE AND TIME; for relation to other planets, SOLAR SYSTEM and ASTRONOMY. The article GEOGRAPHY with its list of related subjects may also be consulted, and the following topics will be found especially helpful:

Air
Antarctic Circle
Apsides
Arctic Circle
Axis
Chart
Climate
Degree
Earth Currents
Earthquake
Ecliptic
Equator
Equinox
Globe
Gravitation
Hemisphere
Hydrography
Latitude
Longitude
Meridian
Moon
Nebular Hypothesis
Ocean
Oceanography
Perigee
Physical Geography
Pole
Sky
Solstice
Tides
Tropics
Zodiac
Zone

EARTH CUR'RENTS. It has been found that telegraph lines in which the circuit is completed by the earth are traversed by natural electric currents which sometimes become strong enough to interfere with the proper working of the line. These currents have been named *earth currents.* The earth currents are always connected with magnetic disturbances in the earth, and when they are strong they are accompanied by brilliant appearances of the aurora borealis. The view which is now generally accepted by men of science is that both the earth currents and the magnetic disturbances are caused by electric currents in the upper regions of the atmosphere, and that these currents are also responsible for the appearance of the aurora borealis. See MAGNETISM; AURORA BOREALIS.

EARTH'QUAKE, a shaking of the ground caused by disturbances within the earth, is a phenomenon about which there is little scientific knowledge. Only within the last three-quarters of a century has there been systematic study of the causes, characteristics and effects of earthquakes. (More about this study, called *seismology,* will be found in the article SEISMOGRAPH.)

Earthquakes are in some places more frequent than storms. In Japan, between 1885 and 1892, about three shocks a day were recorded. Most earthquakes are perceived only with the aid of a detecting and recording instrument, the *seismograph.* When they are violent, the damage is never great unless densely-populated regions are affected; even then it is often due more to resulting fire or waves from the sea than to the shaking of the earth itself. At San Francisco, in 1906, fire was the chief destroyer; at Lisbon, in 1755, the sea.

An earthquake travels through the ground in waves usually but a very small fraction of an inch in width. Waves with a motion up and down of half an inch, or of an inch to and fro, are destructive. In soft land made by rivers or by man, they grow larger; thus at Valparaiso, Chile, in 1906, steel frame buildings on made land collapsed, while ordinary houses built on rock suffered but slightly. Following the example of Japanese seismologists, engineers are learning to construct buildings and bridges capable of withstanding earthquake waves of the usual intensity. One quake in Japan, however, is claimed to have had a wave movement of nearly a foot, which no practical type of building could withstand. Quakes under the sea, of which there are many, produce waves of water too small to wreak damage unless they reach shallow water, where they sometimes roll to a height of thirty or forty feet.

Causes. Most earthquakes are believed the result of changes in the earth's crust, usually the extension of old or the formation of new faults (see FAULT). After the California earthquake of 1906 it was found that along a previously-known fault nearly 300 miles long the strata had shifted horizontally from seven to twenty-one feet, and vertically from one to three feet. The usual points of origin for the disturbance are estimated to be from ten to twenty miles beneath the surface. A second class of shocks is ascribed to volcanoes. Its waves travel only a few miles, while those from the first variety sometimes extend around the world. A few minor earthquakes are thought to be due to the collapse of the underground caves.

The accompanying map shows that nearly all the great earthquake regions are in volcanic areas. Some scientists infer from this a common origin for the two, namely, the explosion of steam generated in the interior of the earth through the overheating of rocks containing water. But because the majority of the earthquake regions are those particularly liable to shifting strata—lofty ranges, as the Himalayas,

THE ZONES OF EARTHQUAKES AND VOLCANOES

or where mountains rise almost directly out of a deep sea, as on the west coast of the two Americas—most scientists prefer the theory of fracture and faults. But for these last there seems to be no logical explanation, unless it be the constant shrinkage of the earth's crust from cooling of the core beneath. As a matter of fact, the most severe shocks occur in young mountain ranges, as these are commonly regions of uplift. This is true in the Western Highland region of the American continent and also of the chain of islands off the east coast of the Asian continent. Earthquakes are about as frequent in the Appalachian highlands and the Atlantic coast region as in the Pacific coast region, but they are so feeble that one rarely feels the shock.

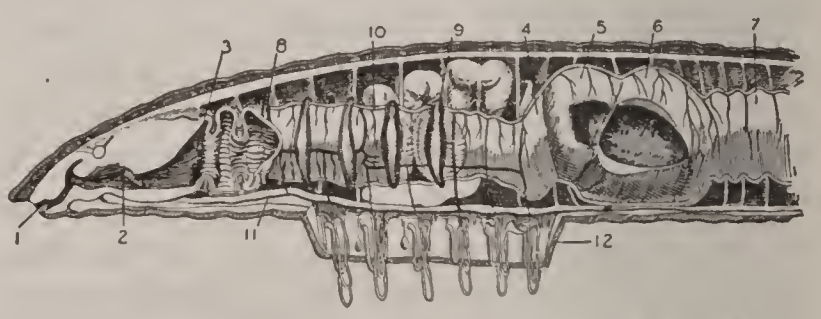
Seismology. Besides a better knowledge of how to build in affected areas, the benefits hoped for from the scientific study of earthquakes are a means of foretelling them and an acquaintance with those portions of the sea to be avoided in laying submarine cables. As most great shocks are preceded a few days earlier by minor shocks, the first task does not seem impossible.

Great Earthquakes. Following is a list of the most violent earthquakes of recent times, arranged in order of their destructiveness:

Messina, 1908; 76,483 lost, city destroyed
Calabria and Sicily, 1783; 60,000 lost
Lisbon, 1755; 40,000 lost, huge sea wave
Charleston, 1886; most of city destroyed
Kangra, India, 1905; 20,000 lost
Valparaiso, Chile, 1906; great havoc from fire
Kingston, Jamaica, 1907; wave and fire
San Francisco, 1906 city swept by fire
Assam, 1897; a very severe shock. China, 1920; thousands killed.

Consult Russell's *Volcanoes of North America.*

EARTH'WORM, ANGLEWORM, or **FISH-WORM,** a creeping, shiny-skinned, light red-brown worm, popularly known as a favorite bait for the fisherman. How many know, however, its value in the wonderful workings of nature? The burrows it makes in the soil where it lives admit air and rain to the earth and make it more mellow, and those same burrows make convenient paths for the little roots of valuable plants.



CROSS SECTION OF AN EARTHWORM

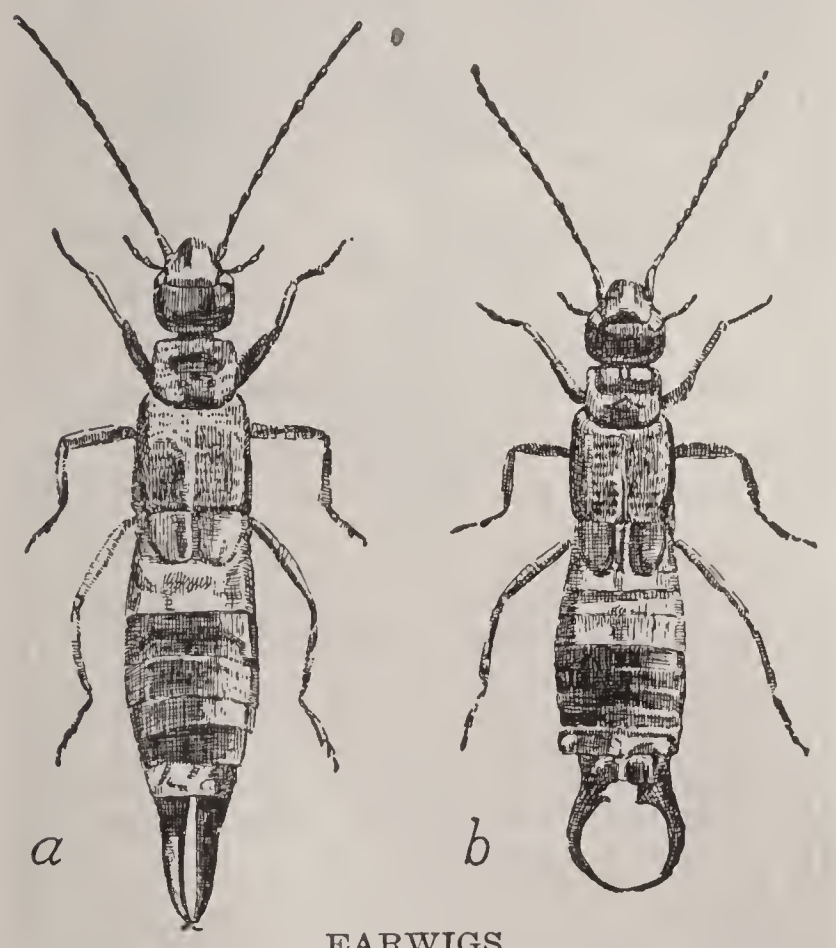
1. Mouth
2. Pharynx
3. Beginning of oesophagus
4. End of oesophagus
5. Crop
6. Gizzard
7. Intestine
8. First heart
9. Second heart
10. Lateral blood vessel
11. Ventral blood vessel
12. Body wall

Darwin says, "The plough is one of the most ancient and most valuable of man's inventions; but long before he existed the land was in fact regularly ploughed, and still continues to be thus ploughed, by earthworms." They reduce irregularities, and eventually bury stones and other objects; and by depositing little heaps of digested food on the surface of the earth add about one-fiftieth of an inch annually to the soil.

The earthworm belongs to the group of true worms; it is a worm which never changes into a beautiful butterfly, moth or miller, as do some so-called worms, but which, from the time of hatching from the egg, is always a cylindrical animal, with body of many segments, an animal which cannot see or hear, yet which has a nervous system sensitive to light and odor. The earthworm feeds at night on vegetable and animal matter, and it has been discovered that it is especially fond of cabbage, celery, raw fat meat and onions. Nearly 1,000 species are found, in all but the coldest and driest regions of the earth. They range from one-twenty-fifth of an inch in length to as much as three yards. They move by means of a double row of bristles on the under side of the body, and by contractions by means of two sets of muscles, one lengthwise of, the other circling around, the body. Their eggs are laid in a hard capsule about the size of a mustard seed; some of these are eaten by the young which hatch from others. Earthworms need moisture and die if through circumstances they are left on dry, hard substances from which they cannot escape. M.S.

Consult Beddard's *Earthworms and Their Allies;* Sedgwick and Wilson's *Biology,* chapter on "Earthworms."

EAR'WIG, the popular name for a group of beetlelike insects. They received this name



EARWIGS

(*a*) Female; (*b*) male. About five times natural size.

because it was believed that they creep into the ears of sleeping persons. Although the destruction of fruit and flowers has been attributed to earwigs, they are, on the other hand, really helpful in the destruction of thrips, snails and caterpillars, on which they feed at night. Their upper wings are short and leathery, the lower ones are gauzelike. Their feelers (antennae) are long and delicate. On the abdomen is a strong pair of pincers, the use for which has not been discovered. Earwigs are found under stones, in decayed bark of trees and in moist places in parts of most European countries. In the United States they are found only in the Southern states and on the Pacific coast. Several small, many-legged insects (centipedes) are also called earwigs in the United States. See CENTIPEDE.

EASEMENT, *eez'ment,* a legal term, meaning an acquired right which the owner of one piece of land has to the use and enjoyment for a particular purpose of adjoining land which belongs to another person. Easement rights are not numerous, but they include such well-known rights as the right of way, the right of having access to air and light, the right to maintain drains or dams or aqueducts upon an adjoining property. Easements are rights belonging to the land and are alienable or inheritable with the land. An easement may arise either by grant, by prescription (that is, by immemorial usage), by implication, or by necessity. The last-named arises when, for instance, one buys a piece of land or premises that are shut off on all sides from access to the highway. There is a reasonable presumption that the owner of the landlocked lot intended to convey to the buyer the right of way over his remaining land.

EAST CHICAGO, IND., in Lake County, is a manufacturing city on the southwestern shore of Lake Michigan, nineteen miles south and east of the business center of Chicago. It is in what is known as the Calumet region, which is rapidly developing into one vast industrial city. East Chicago is joined on the west, south and east by Whiting, Hammond and Gary, among which there is an interchange of labor and trade regardless of city boundary lines. The population of this entire community is approximately 100,000. The population of East Chicago in 1910 was 19,098 and in 1920 it was 35,967. About eighteen per cent of the inhabitants are Americans, thirty per cent are Poles, twelve per cent are Hungarians, and the remainder are of almost every other nationality.

East Chicago is on the main lines of the

New York Central, the Pennsylvania, the Baltimore & Ohio, the Wabash, the Pere Marquette and the Chicago, Lake Shore & South Bend railroads. Three belt roads connect with every railroad entering Chicago. Three electric lines extend to Chicago. The Indiana Harbor ship canal, crossed by a number of bascule bridges, extends from a harbor 300 feet wide and twenty-two feet deep, protected by a modern rubble breakwater, south from Lake Michigan to the Calumet River.

The unsurpassed shipping and transportation facilities of East Chicago have made it a center of iron and steel manufactories, which produce almost every kind of article from a bolt to a locomotive. Other important manufactures are foundry products, cement, lumber, boilers, chemicals, fire brick, soap, liquid air, conduits, hay and cotton presses and automobile trucks; the total value of manufactured products in 1920 was $89,569,000. The city has a city hall erected in 1907 at a cost of $58,500, two Carnegie libraries and six banks. In 1917 a movement was inaugurated to join the city with Gary and Indiana Harbor into one great city, under the commission form of government.

E.C.MC C.

EASTER, *ees'ter.* When life is slowly bursting forth anew in springtime in woods, in parks, in gardens—when, as George Macdonald says, in his *Songs of the Spring Days,*

The holy spirit of the Spring
Is working silently,

—then comes the holy festival called Easter, observed in many branches of the Christian Church to commemorate the resurrection of Christ.

Many customs, beautiful and quaint, have been and still are observed in churches and in homes as an expression of joy because Christ rose from the dead. Churches have special services for this closing of the forty days of Lent (which see), and flowers of white, especially Easter lilies, decorate the altars as a sign of purity and light. The sending of Easter eggs is a custom thought to have originated with the Persians, the eggs being symbols of new life. Coloring them red symbolizes the blood of redemption; other colors have no special significance.

The name Easter comes from the Anglo-Saxon *Eostre,* a goddess of light or spring whose festival was celebrated in April. The name of the festival in Greek, French, Italian and most other languages is taken from the Hebrew *pesach,* meaning *passover,* as by the

Suggestive Programs for Easter

I think of the garden after the rain;
And hope to my heart comes singing,
"At morn the cherry blooms will be white,
And the Easter bells be ringing."

Procter

I

Song, *"Come, ye saints"*.....*Kelly*
Reading, The First Easter, *Luke* XXIV
The Easter Flower.....*Phillips Brooks*
Essay, *What the Name "Easter" Means*
Nature's Easter Music.....*Lucy Larcom*
Essay, *The Easter Lily*
The Song of the Lilies...*Lucy Wheelock*
Essay, *Signs of New Life in Nature*
How the Date for Easter Is Determined
The Voice of Spring.....*Hemans*
Essay, *How the Butterfly Symbolizes the Easter Lesson*
The Spring Is Here..... ..*Bryant*
The Year's at the Spring.....*Browning*

II

Song, *Christ the Lord Is Risen To-day* .....*Wesley*
Essay, *The True Significance of Easter*
The Lily of the Resurrection..... .....*Lucy Larcom*
The First Easter, *John* XX, 1-18
At Easter Time.....*Lucy Wheelock*
Essay, *The Easter Lesson as Shown by a Bulb*
Spring .....*Longfellow*
Essay, *How We Observe Easter*
Essay, *How the Ancients Accounted for the New Life in Nature*—the Story of Proserpina
Essay, *The Return of the Birds*
April .....*Whittier*

first Christians it was considered a continuation of the feast of the Passover at which the paschal lamb, symbol of Christ, was sacrificed.

The Annual Date. The proper time for celebrating Easter was long in dispute in the Christian Church. The Christians of the East first held Easter on the fourteenth of Nisan (corresponding to April), the day on which the Jewish Passover fell (see PASSOVER). The majority of the Church, however, celebrated it on the Sunday after that day. Finally the Council of Nice, in A. D. 325, fixed Easter as Sunday, the first one after the full moon which appears on or next after March 21. By "full moon" is meant the fourteenth day of the calendar moon. If the moon is full March 21, and should that day be Saturday, March 22 would be Easter; that is the earliest date on which it could fall. The latest date for Easter would be April 25; that would be the date if the moon should full on Monday, March 20. M.S.

EASTER LILY, a fragrant, trumpet-shaped flower of waxy whiteness. It stands out horizontally on stately stems from a background of abundant foliage, and not only graces church

THE EASTER LILY

O Risen Christ! O Easter Flower!
How dear Thy Grace has grown!
From East to West, with loving power,
Make all the world Thine own.
PHILLIPS BROOKS: *The Easter Flower.*

altars at Easter time but decorates the monuments of soldiers on Memorial Day and lends its beauty to Christmas festivals.

Until early in the nineteenth century the Madonna lily of Southern Europe was used by American florists for the Easter lily. But its blooming was so uncertain, blossoms often not appearing until several weeks after Easter, that new species were introduced from China, Japan and Bermuda. The Japanese and Chinese species, when grown in the open ground, bloom later than the Bermuda variety, their flowers appearing in June or July. Raised in hothouses, however, they can be forced for Easter blooming, and the flowers are more substantial than those of the Bermuda lily.

It will be noticed that Easter lilies offered by florists are usually without anthers and often without stamens. Those parts of the flower are removed to keep the blossom white and free from pollen; fertilization being prevented, the flower lives longer than otherwise would be the case.

EASTHAMPTON, MASS., a manufacturing town in Hampshire County, situated southwest of the geographical center of the state, four and one-half miles southwest of Northampton. The New York, New Haven & Hartford and the Boston & Maine railways provide transportation service, and trolley lines extend north and south. The first settlement was made in 1665; it was incorporated as a district in 1785 and as a town in 1809. In 1916 the population was 10,360, an increase of 1,836 since 1910. The area exceeds fourteen square miles.

Easthampton is engaged in making buttons, rubber and electric goods, drop forgings, cotton goods and yarns, and has one of the largest dyeing and mercerizing plants in the United States. Beside its public schools and library the town has Williston Seminary, one of the oldest preparatory schools for boys in New England. This school was founded in 1841 by Samuel and Emily Graves Williston, who built up in Easthampton the industry of covering buttons with cloth. J.R.

EAST IN'DIA COMPANY, a trading company formed in 1590 in London and given by the British government what was practically a monopoly of the trade with India and the East. The first charter, granted by Queen Elizabeth, conferred on it sole rights of trading in the countries specified, for a term of fifteen years. The company was by no means rich, for at first the stockholders advanced money to defray the expenses of the voyages, which were not very successful. James I renewed the charter, and the company was reorganized with a capital of $2,000,000, which was later increased to $6,000,000. Under the new charter, the company not only had exclusive trading rights, but was empowered to seize and confiscate ships and goods of other traders of any nationality.

From the point of view of trading and devel-

oping commerce, the company performed services that were of benefit to the world. Political rights were soon assumed, however, and the agents of the company not only interfered in Indian affairs, but, in the vicinity of their trading posts, endeavored to direct them. The French also were strongly established in the Eastern market; clashes between the employees of the East India Company and French companies were frequent, and these eventually led to open warfare. The troops organized by the British company defeated the French and their native allies and finally Clive, by his victory at Plassey, laid the foundation of a great Indian empire.

Trade with India was thrown open to all British subjects in 1813. The company retained exclusive rights to the Chinese trade, but the king was empowered to direct their political and legislative activities in India. In 1857 the company found itself unable to cope with the terrible Sepoy Rebellion (which see), and the affairs of India were placed in the hands of the British government.

The East India Company served the world as pioneers and blazed the trails to new fields of commerce. By them the wealth of the Indies was revealed, and the eyes of the commercial world were turned Eastward. It might be said that, indirectly, the East India Company was responsible for the building of the Suez Canal, as its traders were among the first to point out the great advantages to be reaped by quicker routes for trading with India and the Far East. F.ST.A.

EAST INDIES, *in'diz,* in its broadest sense the name applied to the southeastern part of Asia, including India, the Malay Peninsula and the islands of the Malay Archipelago, together with the Philippine Islands. It is customary to speak of the islands of this region as the *East India Islands,* and the Dutch possessions of the Malay Archipelago as the *Dutch East Indies.* The name *Indies* originated in the fifteenth century, and it was in an effort to find a shorter route to these lands that Columbus discovered America. Believing the newly-discovered islands of the western hemisphere to be the extreme western parts of the Indian region, the name *Indies* was given to them. Later they and the eastern lands were distinguished as East and West Indies.

EAST INDIES, Dutch, the name collectively given to the islands in the Malay Archipelago, owned by Holland. They include Java, Sumatra, Madura, Billiton, Celebes, the Moluccas, Bali, Riau Lingga, parts of Timor, Borneo and Papua, and numerous smaller islands. The total area is estimated at 683,000 square miles, or nearly three times that of Texas or of the province of Alberta. Politically they are divided into two main divisions, known as Java and Madura, and Outpost Provinces. The colony as a whole is administered by a governor-general sent from The Hague, assisted by a council. The capital is Batavia, with a population of 142,011 in 1920. Population of the colony, 49,161,047 in 1920.

EAST LIVERPOOL, Ohio, the most important porcelain and pottery center in the United States, situated in Columbiana County and on the Ohio River, near the eastern border of the state. Pittsburgh, Pa., is forty-four miles southeast, and Wheeling, W. Va., is fifty miles south. Railway transportation is provided by the Pennsylvania Lines. Freight packet lines connect with all important ports on the Ohio River, and interurban electric lines communicate with cities north, east and south. Chester and Newell, W. Va., across the river, are connected with East Liverpool by bridges. In its population of 21,411 (1920) Americans predominate, but English, Scotch, Irish and Germans form a considerable number; the figure given shows an increase of 1,024 since 1910. The area of the city is about three square miles.

Owing to the extent of its pottery industry, East Liverpool is locally known as the *Staffordshire of America.* There are over thirty pottery works in the city; their products include white granite, terra-cotta, yellow and Rockingham wares. Dinner-ware, floor tile, electrical supplies and toilet wares are manufactured by the porcelain plants. There are also flint mills, glass works, foundries and machine shops. Natural gas furnishes light and fuel. The principal buildings of the city are the Federal building, erected at a cost of nearly $160,000; a $150,000 high school; a $70,000 New Elks' Temple, a $70,000 I. O. O. F. building and the Potters' Savings and Loan Building, which cost $100,000. The library was a $50,000 gift of Andrew Carnegie.

East Liverpool was settled in 1798 and named Saint Clair, in honor of General Arthur Saint Clair of Revolutionary fame. Early in 1802 the name was changed to Fawcettstown, and in 1816 to Liverpool. In 1834 it was incorporated as a village, when it received its present name. The first pottery was built on the banks of the Ohio River, by the Bennett

Brothers; this plant was swept away by the flood of 1852 and was not rebuilt.

EASTON, *ees' tun,* PA., an important shipping point in the eastern part of the state, a manufacturing city, and the county seat of Northampton County. It is situated on the Delaware River, which forms the eastern boundary of the state, at the point where it receives the waters of the Lehigh River. Allentown is seventeen miles southwest, Philadelphia is sixty-nine miles south and New York City is seventy-four miles east. The Central of New Jersey; the Delaware, Lackawanna & Western; the Lehigh Valley, and the Pennsylvania railroads serve the city, and interurban trolley lines connect with adjacent cities and towns, serving 200,000 people. Bridges connect with Phillipsburg, across the Delaware River, and with South Easton, on the opposite shore of the Lehigh. All nationalities are represented in the population, which increased from 28,523 in 1910 to 33,813 in 1920. The area of the city exceeds three square miles.

Easton is located in the picturesque valley of the Delaware and Lehigh rivers, bordered by rugged hills, on the slopes of which the newer section of the city is built. The older part has a central public square, and many of the buildings were constructed before the Revolutionary War. The city has a $75,000 Federal building, a $75,000 Carnegie Library, handsome bank buildings constructed at a total cost of $1,000,000, and three hospitals. Lafayette College, Park Academy and two business colleges supplement the public school system.

The region surrounding Easton is known as the great cement belt, but it is also rich in deposits of slate, iron ore and anthracite coal. Within a twenty-five mile radius, sixty-five per cent of the entire American slate output is quarried and manufactured, and forty per cent of the entire American Portland cement output is made. There is direct water route to New York and Philadelphia. Its many, varied manufactures range from heavy mining machinery to light silken fabrics. There are several large blast furnaces, rolling mills and foundries. About 5,500 people are engaged in the silk industry.

History. Easton was founded in 1752, was incorporated as a borough in 1789 and was chartered as a city in 1887. It was named for William Penn's manor-seat in England. Important treaties with the Indians were made here at various times between 1756 and 1761, and it was the starting point for General John Sullivan's expedition against the Iroquois Indians. The Reformed Church in North Third Street, used as a hospital by the patriots during the War of Independence, and the home of George Taylor, one of the signers of the Declaration of Independence, are historical features of interest. In 1912 Easton adopted the commission form of government, with five elective officers. T.A.H.H.

EAST ORANGE, N. J., a residential city in Essex County, ten miles west of New York City. It is in the northeastern part of the state, adjoining Newark, and with Orange, West Orange and South Orange, forms practically one community known as "the Oranges." It is served by the Orange branch of the Erie Railroad, which has two stations in the city, and by the Delaware, Lackawanna & Western, which has four stations. There are electric lines to neighboring cities. The population, which in 1910 was 34,371, was 50,587 by the census of 1920.

East Orange has many attractive suburban homes and villas. There are several handsome churches, a $400,000 high school building, a city hall, a Carnegie Library and the clubhouse of the Woman's Club of Orange. There are important manufactories of dynamos and other electrical appliances, pharmaceutical supplies, valve fittings and water-works supplies.

The township of East Orange was separated in 1863 from the township of Orange, which in 1806 had been separated from the township of Newark. It became a city in 1899. R.H.D.

EAST PROVIDENCE, R. I., a town in Providence County, on the east bank of the Seekonk River, by which it is separated from Providence, the state capital. It is on the New York, New Haven & Hartford Railroad and on electric interurban lines. The industrial enterprises include oyster fisheries, chemical, electrical and wire works, a shoe-string factory and a bleachery. East Providence was settled about 1644 and was first a part of Rehoboth. Seekonk was separated from Rehoboth in 1812, and after the adjustment of the Massachusetts-Rhode Island boundary line, East Providence was separated from Seekonk and incorporated in 1862. The area of the town exceeds thirteen and one-half square miles. In 1910 the population was 15,808; in 1920 it was 21,793.

EAST RIVER, the ten-mile strait connecting Long Island Sound and New York harbor, separating the boroughs of Brooklyn and Manhattan. It is connected with the Hudson River by the Harlem River and Spuyten Duyvil

Creek. The former rock obstruction at Hell Gate, the waterway between Ward's and Randall's islands, was removed by blasting in 1885, leaving the channel wide enough for the passage of the largest ships into Long Island Sound. Within the space of one square mile, crossing the East River, are the four greatest suspension bridges in existence. The lower part of the East River is a part of New York's great harbor. The United States Navy Yard, one of the leading stations of the country, is located on the Brooklyn side and comprises an area of forty-five acres.

There are no shipping piers for trans-Atlantic lines on East River, as these are located on the other side of the island, in the Hudson River. The West Indies' boats and those in the coastwise trade have nearly all their docks in the East River and on the southern shore of Long Island.

EAST SAINT LOUIS, Ill., an important railway and manufacturing center and one of the largest distributing points for live stock in the United States. It is situated in Saint Clair County, on the southwestern border of the state and on the east bank of the Mississippi River. The Eads Bridge (see Eads), classed with the finest steel arch bridges in the United States, connects it with Saint Louis, Mo., on the opposite bank. East Saint Louis is the terminus of all the railroads entering Saint Louis from the east—the Baltimore & Ohio Southwestern; Chicago, Peoria & Saint Louis; Cleveland, Cincinnati, Chicago & Saint Louis; Illinois Central; Louisville & Nashville; Mobile & Ohio; the Wabash, and the Pennsylvania Lines. The city also has the service of the packet lines on the river and of several interurban lines. In 1920 the population was 66,740, an increase of 8,193 since 1910. The city occupies an area of twelve square miles.

Near the river the land is low, and this part of the city is occupied by the grain elevators and many of the industrial establishments. The residence district lies farther east. In recent years several millions of dollars have been expended on public improvements, principally for drainage and flood protection. There are several parks, a city hall, a high school, a Roman Catholic academy, a public library and a business college. Manufacturing and industrial interests are increased by the location of the city near the vast coal fields of Illinois. The leading products are malleable iron, railway-track accessories, locomotives, foundry products, railway-car supplies, baking powder and flour. There are large rolling mills, coal and coke plants, and one of the largest stockyards in the United States; beef and pork packing is an extensive industry. The city is an important mule market.

East Saint Louis was incorporated as a village in 1861 and as a city in 1865. In 1896 it was swept by a tornado which caused the loss of 500 lives and destruction of property estimated at $10,000,000. In 1917 the city adopted the commission form of government.

EATON, *e'tun,* Sir John Craig (1875-1922), a Canadian merchant, since 1907 president of T. Eaton Company, of Toronto and Winnipeg, the great merchandising firm established by his father, the late Timothy Eaton. This firm, which employs about 15,000 men and women, operates the largest department store in the Dominion and is regarded almost as a national institution. The founder of the firm trained his son, who was born in Toronto and attended the Toronto Model School, to a business career. Under the direction of the son the business continued to grow, but its head also found time for much philanthropic work. At the outbreak of the War of the Nations in 1914 Eaton at once donated $100,000 to the Canadian government for the equipment of a battery, and offered the use of his private yacht, said to be the fastest on the Great Lakes, and his wireless station, the most powerful in Canada. The firm of T. Eaton Company continued to pay full salaries to all of its employees who enlisted for active service, and also insured their lives in order that dependent families need not suffer from poverty in the event of the bread-winner's death. In recognition of his patriotic services Eaton was knighted in 1915. G.H.L.

EAU CLAIRE, Wis., the commercial center of the northwestern part of the state, noted for its lumber interests. It is the county seat of Eau Claire County, and is situated northwest of the geographical center of the state, at the head of navigation of the Chippewa River, which at this point receives the waters of the Eau Claire River. These two rivers divide the city into three parts, which are connected by several bridges. By rail Saint Paul is eighty-seven miles west, Duluth is 161 miles northwest and Madison, the capital of Wisconsin, 184 miles southeast. The Minneapolis, Saint Paul & Sault Sainte Marie; the Chicago, Saint Paul, Minneapolis & Omaha, and the Chicago, Milwaukee & Saint Paul railways serve the city; electric lines connect with

Chippewa Falls, ten miles north. Germans and Norwegians predominate in the mixed population, which in 1920 was 20,880, an increase of 2,570 since 1910. The area exceeds thirteen square miles.

Locally, Eau Claire is known as *The Heart of the Chippewa Valley.* Commercially it is entitled to the name, as it is the wholesale and jobbing market and lumber center for this prosperous valley. Abundant water power for manufacture is provided by the two rivers named above. Besides extensive lumber mills, there are foundries, paper mills, steel and iron works, canneries, woolen and linen mills and manufactories of shoes, furniture, refrigerators and boxes. Eau Claire is also the hub of the agricultural and dairy section of this part of the state. The city has a Federal building, completed in 1909 at a cost of $175,000, a $100,000 Y. M. C. A. building, a Carnegie Library with 17,200 volumes, and one of the state normal schools, built at a cost of $225,000. There are four parks, a tuberculosis sanitarium and two hospitals.

Eau Claire was settled in 1845 and was incorporated in 1856. The name is a French term meaning *clear water.* The growth of the city began with the development of the northwestern lumber trade in 1870. The city was the first in Wisconsin to adopt the commission form of government (1910). R.F.K.

EBERS, *ay'berz,* Georg Moritz (1837-1898), a German writer of historical tales and one of the leading authorities on matters pertaining to ancient Egypt, was born in Berlin. He was early in life a pupil of Froebel, but soon began the study of ancient remains in Egypt. In 1875 he was appointed professor of Egyptology in Leipzig, but on account of ill health resigned in 1889. He visited Egypt many times and made excavations which revealed valuable papyrus manuscripts and specimens of Egyptian art. His works descriptive of Syrian and Egyptian life have the charm of appealing to public curiosity about distant ages and strange lands, and include *Egypt in Picture and Word, An Egyptian Princess, Uarda* and *The Sisters.*

EBONY, *eb'un i,* a wood famed for its hardness. Its color gives rise to the expression, "black as ebony." The most valuable ebony is the heart-wood of a tree found in India and Ceylon, which yields logs from one to three feet in diameter and from ten to fifteen feet in length. Other choice varieties are found in the East and West Indies and in British and French Guiana. A fair grade is occasionally furnished by certain species of the persimmon tree common throughout the Southern United States. Because it will take a high polish, ebony is in demand for ornamental cabinet work, musical instruments, inlaying and veneering. Because of its durability the black piano keys are made from it.

Reference to its use by the ancients for scepters, images and drinking cups is found in the classics. Herodotus mentions it as an article of tribute, and still earlier Ezekiel (*Ezekiel* XXVII:15), in his lamentation for Tyre, says:

"They brought thee for a present horns of ivory and ebony."

The bark of the tree mixed with pepper is used medicinally by the natives of India.

ECCLESIASTES, *ek kle zi as' teez,* a book of the Old Testament whose authorship is unknown, but which is ascribed to a late Biblical period because of its language and style of composition. The Hebrew name *Koheleth* means *preacher,* and many thought that Solomon was the author, because Koheleth calls himself the son of David, but now the name is considered merely a general term. In this book the preacher questions everything—the value of immortality, virtue, divine justice and the advantage of wisdom, but he wishes to teach contentment and quiet enjoyment of the blessings God has bestowed on man. It is not a historical but rather a poetical composition.

ECHIDNA, *e kid'nah,* or **SPINY ANTEATER,** a genus of peculiar Australian mammals, closely related to the duckbill (which see), both of which in some ways resemble mammals, birds and reptiles. The echidna has a twelve- or eighteen-inch body, covered above with hair and hedgehoglike spines, and below with soft hair. It has short, strong legs, ending in five toes armed with powerful claws, which enable it to dig into the ground to make its burrow. The head is small and extends into a long, slender snout, from which a long, flexible, sticky tongue can be thrust to gather its food of ants and other insects. There are no teeth, but the palate is furnished with spines. The female echidna lays one or two eggs, one then being placed in a temporary pouch in her body and carried there for two weeks, when it hatches. The young echidna is also carried in that pouch until it is ready to walk. The value of this strange animal is doubtful.

ECHINODERMS, *e ki'no durmz,* one of the great branches of the animal kingdom, the name of which, meaning *spiny-skinned,* refers

to the prickly covering characteristic of many members of the group. According to the modern classification, the echinoderms are ranked between the insects (Arthropoda) and the vertebrates. All make their home in the sea. They are divided into starfishes, sea urchins, brittle stars, sea cucumbers and sea lilies. Their typical structure is that of a central disk, from which five arms radiate, much as the spokes of a wheel branch from the hub. In some species the arms divide again and again. The mouth is located on the underside of the central disk.

Embedded in the body wall of nearly all echinoderms is a skeleton made up of minute plates consisting of lime and carbonic acid. These plates often bear spines, which are admirable weapons of defense and also serve to protect the internal organs. The organs of digestion and reproduction are contained in a body cavity enclosed by the body wall. Seaweed, clams, oysters, barnacles and other marine animals are consumed by some species, and the sea cucumbers take into the body large quantities of sand. There are about 3,000 living species, found in all the seas of the globe, but they are most abundant in tropical waters.

Related Subjects. The reader is referred to the following articles in these volumes:

Arthropoda	Sea Urchin
Crinoidea	Starfish
Sea Cucumbers	Vertebrates

ECHO, *ek'oh,* a reproduction of sound caused by sound waves striking an obstacle and being thrown back towards their starting point. How sound originates is explained under the title Sound, in these volumes. Whether or not the word *echo* was applied because of the old Greek myth described below, people will nevertheless always associate it with that pleasing, sentimental tale.

An echo may be reflected from a building, a hill or other obstacle, either directly back towards the point at which it originated, or at such an angle that the sound cannot be heard at the point of origin. Sound travels at the rate of 1,080 feet per second when the temperature is at the freezing point. The echo travels at the same speed as the original sound, so that anyone standing 540 feet from the reflecting obstacle would hear the echo in one second, if it were sent straight back to him. The velocity of sound increases at the rate of two feet per second for every rise of one degree in temperature; in the average temperatures of North America it travels about 1,125 feet per second.

At Woodstock, England, there is a remarkable echo which repeats fourteen syllables, but in most cases the echo can only make audible such sounds as can be heard in one second. A single sound such as a shout may be thrown back distinctly by many cliffs, but a sentence is usually a confusion of sounds, and only the last syllable is audible. An echo is often helpful to mariners in foggy weather by enabling them to calculate the distance to cliffs from which the sound is reflected. The time between production of the sound and hearing of the echo is noted, and the distance is easily ascertained.

In Greek Mythology. Echo was a beautiful nymph, an attendant of Diana, the huntress, and noted for her conversational powers. On one occasion when the jealous Juno was seeking her husband Jupiter, believing him to be with the nymphs, Echo detained her in conversation until Jupiter escaped. The goddess punished her by condemning her never to speak first, and always to repeat the last word she heard from others. A more poetic version is that Echo fell in love with Narcissus, a beautiful youth insensible to love, and because he did not return her affection she pined away until nothing was left but her voice, which may still be heard in the mountains, speaking only when spoken to and replying only in the exact words of the speaker. Many poets have found inspiration in this legend, among them Shelley in his poem *Adonais*:

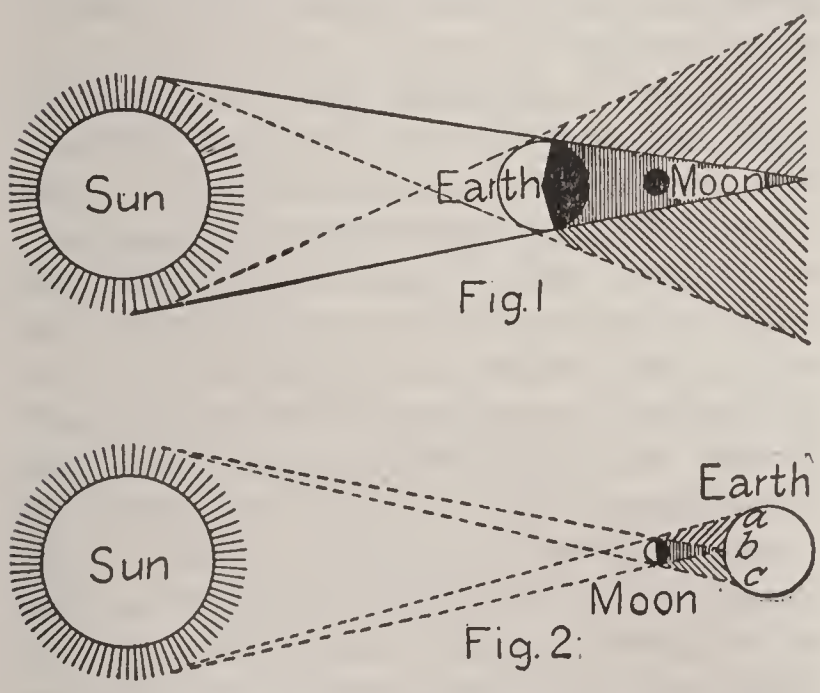
Lost Echo sits amid the voiceless mountains,
And feeds her grief.

ECK, Johann Maier von (1486-1543), a German debater and writer, and powerful opponent of Martin Luther, was born in Suabia. He entered the University of Heidelberg at the age of eleven and obtained a degree at Tübingen when he was fourteen. In 1510 he became professor of theology at Ingolstadt, and in 1518 wrote and privately circulated a pamphlet against Luther's thesis on the mass. Carlstadt, who was a most extreme reformer, and Luther wrote replies to this work, and Eck finally challenged Luther to debate with him at Leipzig on the Papal supremacy. This meeting took place in June, 1519, and after a discussion of three weeks, he forced Luther into an admission that, under certain circumstances, it might be right to disobey the Pope and the great Council of Constance. Eck left Leipzig the victor in the encounter but still was

not satisfied, and in 1520 he visited Rome and urged the Pope to take measures against Luther. The Pope assented and he returned with the bull, or edict, of condemnation, which Luther publicly burned. In 1527 Eck disputed at Baden, Switzerland, with Haller of Berne and attended the Augsburg Diet in 1530. He also took part in the conference at Worms in 1540. See LUTHER, MARTIN. G.W.M.

ECLIPSE, *e klips'*, the total or partial obscuring of a heavenly body by another or by the shadow of another. This phenomenon is called an *eclipse* only when it affects the sun or the moon. The hiding of one star by another is called an *occultation.* A very simple experiment clearly illustrates the phenomenon of an eclipse. A small marble held between the thumb and forefinger a short distance before one eye will completely hide the moon; at a greater distance it shows the effect of an *annular* eclipse, by which is meant leaving a ring of the moon visible. By moving it to one side the appearance of a *partial* eclipse may be obtained. The same results would be noticed with regard to the sun, but that body is too bright to be directly regarded by the naked eye.

Superstitions concerning the supernatural causes of eclipses have not yet completely died out. In Russia an eclipse is still believed by the peasants to be a sign of the wrath of God. In 1914, during the early stages of the War of



DIAGRAMS EXPLAINING ECLIPSES

the Nations, an eclipse occurred, and a special warning was issued explaining to the ignorant Russian soldiers that it was not a sign that God had doomed them to defeat.

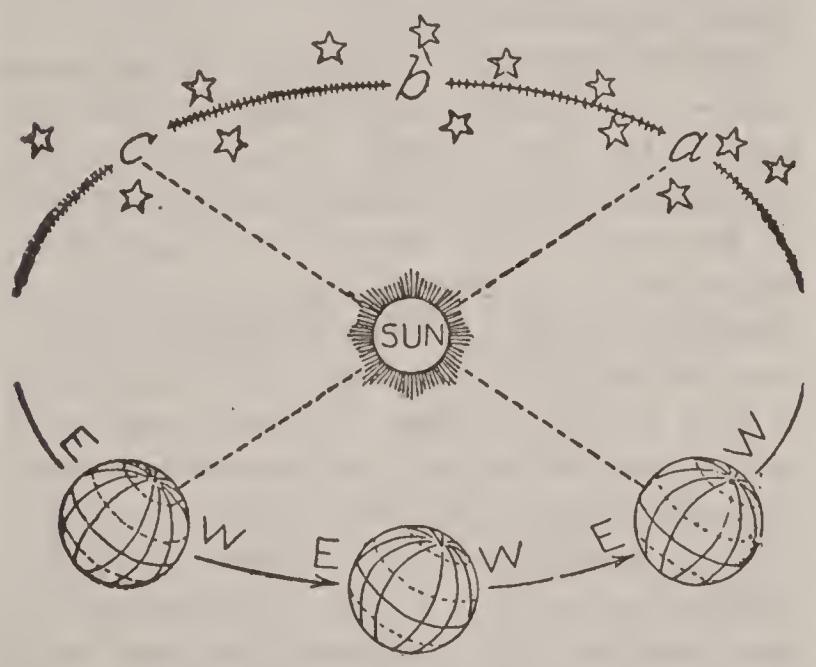
Eclipse of the Moon. Although long regarded as supernatural, an eclipse of the moon is easily explained as the result of purely natural causes. The light of the sun upon the earth causes the earth to throw a shadow into space. When the moon, in its journey round the earth, enters that shadow it becomes obscured. It may be totally or partially eclipsed, but even when completely in the shadow of the earth it remains visible, owing to the refraction of the sun's light. The eclipse always commences on the eastern side of the moon and ends on the western. A total eclipse may last two hours, as the shadow thrown by the earth at the point where the moon enters it is double the diameter of the moon, which itself travels the length of its diameter in one hour. Lunar eclipses happen only when the moon is at the full. They do not happen at every full moon, as the moon generally passes the shadow without entering it. The accompanying diagram shows the conelike nature of the shadow thrown by the spherical body of the earth (see Fig. 1). It completely eclipses the moon to those on the side of the earth directly opposite the sun.

Eclipse of the Sun. When the moon passes between the earth and the sun it hides the face of the sun, partially or completely. It may pass so near to the earth that the face of the sun is fully covered, or it may pass across the sun so that only part of that orb is concealed. What is termed an *annular* eclipse may be produced by the passage of the moon at such a distance from the earth that it obscures only the central portion of the sun's disk, leaving an outer ring visible. An eclipse of the sun commences on the eastern and terminates on the western side. The accompanying diagram (Fig. 2) explains the cause of a solar eclipse. The moon, being between the sun and the earth, throws its direct shadow on the earth at *b,* and to anyone on the earth at this point the eclipse would be total. The outer shadow between the true shadow and the full outside light falls on the earth between *b* and *a* and *b* and *c.* To persons on the earth between these points the sun would be partially eclipsed.

Predicting Eclipses. To the general observer it appears little short of miraculous that eclipses can be accurately predicted, but to the astronomer, with the resources of spherical trigonometry at his command, it is a comparatively simple matter. It does seem almost incredible, however, that the ancients, who possessed almost no accurate scientific knowledge as to the movements of the heavenly bodies, should have been able to foretell

eclipses, but such was the case. Their astrologers had made observations and records, and figuring from these predicted lunar eclipses with great accuracy. The foretelling of solar eclipses, however, they never found satisfactory, but this was because successive eclipses were frequently not visible in the same place, and thus many of them passed unnoticed.

ECLIPTIC, *e klip' tik.* If you watch the few stars that are bright enough to be seen at sunset you will notice that one by one, as the days go by, they drop past the horizon and are not seen till they reappear in the east months later. Before the days of Copernicus, when people thought that the sun moved around the earth, they also regarded the stars as bright points in a great hollow globe, and as this globe slowly moved toward the west the sun seemed to trace a path from west to east among the stars. This path they called the *ecliptic,* because eclipses seemed always to occur in or near it. They divided its circle into



THE ECLIPTIC

The solid line marks the earth's path in the ecliptic plane. The crossed lines above (*a, b, c*) mark the sun's apparent path in the heavens, the ecliptic of the ancients. To an astronomer looking at the sky in summer the sun would appear to be at *a,* and the stars around *b* and *c,* east of the sun. Some months later, at the same hour of the day, the sun's position would appear to be at *c,* and the stars at *b* would be west of it.

twelve parts, the names of which will be found in the article Zodiac.

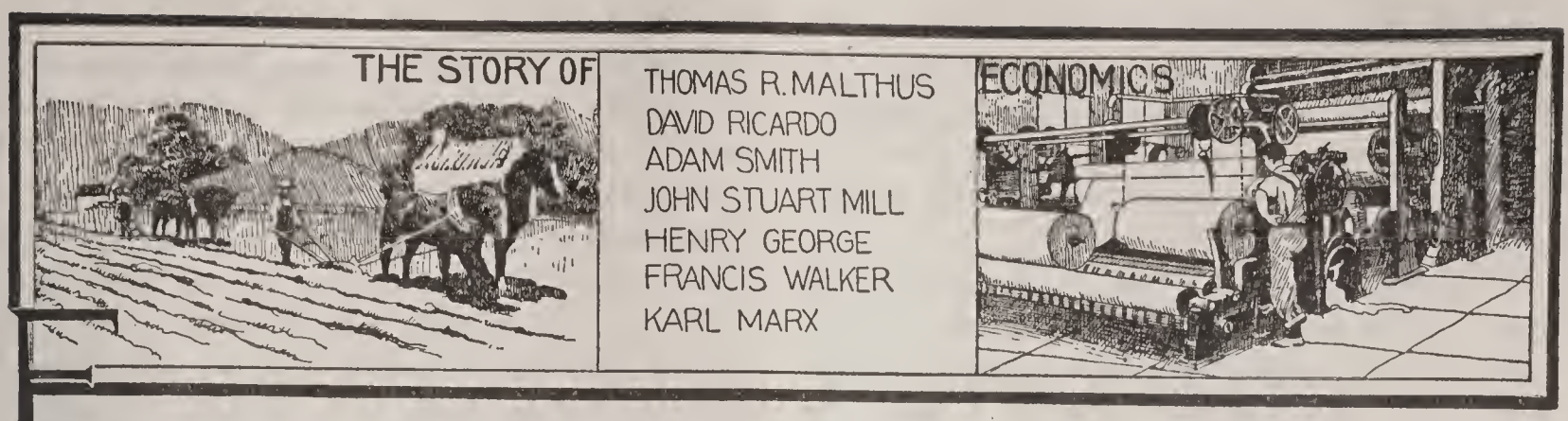
The orbit in which the earth journeys around the sun marks the *plane of the ecliptic.* The earth is not set straight up and down in this plane, but leans toward it about 23.5°, a circumstance which gives us our changing seasons. When the ancient astronomers first noted this leaning it was even greater than it is now, for every century the earth is about 47″ (about 13/1000 of a degree) nearer to perpendicular. But astronomers tell us that when the angle is only 22.25° it will grow larger again till it is about 25°.

ÉCOLE DES BEAUX-ARTS, *a kohl day bo-zahr',* founded in 1648 by Cardinal Mazarin, is the French government's widely-known school of fine arts in Paris, and one of the most influential institutions of its kind. It enrolls pupils from all sections of the world, though the Americans lead all the foreign nations represented; indeed, the strong influence of French architecture in the United States is traced to the American graduates from this famous school. Courses are offered in drawing, painting, sculpture, architecture, engraving, modeling and gem cutting, but architecture is now considered its most significant branch. In 1666 the *Prix de Rome* (Prize of Rome) was instituted, the competition being open to all artists between the ages of fifteen and twenty-five, whether pupils of this school or not, after they had passed two preliminary examinations. The successful competitors are given an allowance from the state for three or four years, two of which must be spent in study at Rome.

ECOLOGY, *e kol' o ji.* When we study plants, mosses and trees, we try to learn whether they like to grow in the sun or shade, whether in or out of water, and what kind of soil they like best. Then, too, we look to see what plants grow near each other, and whether or not they grow in large groups. This leads us to dividing the plants into different groups, according to their habits, and such a study is called *ecology.*

The most important fact to consider in grouping all seed plants is their need of water, for many plants are protected from dry seasons by having a thick covering on their leaves, a supply of water stored in their outer cells and a waxy or hairy covering on their leaves and stems. Other plants grow in the water and are not protected to withstand a drought. Mosses and ferns like the shade, while many plants grow only in bright sunlight. The young seedlings of many forest trees like the shade best at first, but after flourishing there a few years they need the sunshine to make them grow into large trees. The red spruce sometimes grows for over fifty years in the shade, but its trunk will not be more than two inches in diameter; then when it is given sunlight by the cutting down of larger trees, it rapidly grows into a valuable timber tree.

Ecology also deals with cross-fertilization and seed distribution. See Cross-Fertilization; Seeds, subtitle *Seed Dispersal.*



ECONOMICS, *e ko nom' iks,* the knowledge of the principles which govern business and the production, exchange and consumption of all those things which man considers valuable. The word originally referred to household management, so the term *political economy* was introduced to deal with the affairs of the whole family of mankind. In recent years the two names have become identical in meaning.

All sciences show us that things are not always what they seem to the casual observer. Just as astronomy has taught us that the sun does not move across a flat earth, so economics reveals to us that we have held many false notions about such matters as value, money, wages, capital, interest, rent, taxes, tariff, insurance, labor organizations and socialism.

Wealth. Economics might be termed the study of the relation of man to wealth and to wealth-getting and wealth-using. In economics *wealth* does not mean great riches, but those things which make up riches, or in other words, all things of value. Thus a poor man has some wealth if he merely owns his clothing; he is only called poor because he has less wealth than others. In the past, too many economists emphasized the study of wealth itself, neglecting man's relation to it. This has resulted in such doctrines as the *laissez faire* (French for *let alone*), popular a century ago, which maintained that the government should never interfere with private business, no matter what injustices were involved. To-day, as characteristic of the newer age in which we live, economics is concerned first of all with *man.* Where the students of previous generations merely observed that wealth seems to be unequally distributed, those of to-day search for possible remedies for poverty and want.

The Coöperation of the World. No one with a broad outlook on life can advance very far into the study of economics without seeing that mankind is truly one family, with common interests and common aspirations. If you are selfish and greedy, a knowledge of the laws underlying wealth will show you that if you rob or withhold from others you injure yourself as well.

Selfish viewpoints have resulted in many false beliefs about political economy, some of which are still widely held. Wealth is always the joint product of three primary factors, land, labor and capital, and never of one alone. In many places the private holding of large areas of land is plainly detrimental to a nation's advance, but the land owners are always firm in the belief that their possession is the direct and just result of the working of economic laws. Laborers, on their side, urge the injustice of private ownership of capital, but it is noticeable that in countries where the working man finds it easy to invest his savings to earn interest, so that in effect he becomes a small capitalist, his objection is less strong. The capitalist, in his turn, almost to the present time, has believed that all laws in behalf of the laborer, for shorter hours, for better places to work, for a minimum wage, for the prevention of child labor, were in defiance of all economic principle. It is plain that these conflicting claims cannot all be right. Each factor is entitled to its share, and when all abandon the bias with which they study economics they will realize the necessity of coöperation.

Division of Labor. If you had been a lone castaway on a distant island, obliged to gather all your own food, and another wreck gave you a companion, you would agree with him upon a *division of labor;* that is, while one of you hunted turtle's eggs on the shore, the other might be picking berries in the woods; if one went inland to get fresh water, the other might stay to watch for the smoke of a passing steamer. By this coöperation much more than twice the work would be accomplished than had been previously performed by you alone.

It is upon such division of labor that modern industry is built. From the simple coöperation of two persons we have advanced to that of all nations. All of us are more de-

pendent on the help of the races on the other side of the globe than our grandfather's grandfather was on that of his next-door neighbor; the interruption of trade by the War of the Nations caused economic distress even in far-away Brazil.

If there were no artificial restrictions the world would soon reach the stage where every person in it would coöperate to some extent with every other person. Just as it would be foolish for each of the two on the island to gather his own berries and his own eggs, so to economists it seems useless for a nation to attempt absolute independence of other nations. If France can make silk better and more cheaply than it can be made in Canada, and Canada can raise wheat more easily than can France, both countries will have more wealth if they accept each other's help.

Distribution of Wealth. The complex division of labor in the modern world increases the difficulty of knowing what is the just reward of each factor. If you borrow a saw from your neighbor to build a bench, it is plain that the added value given the lumber in its new form is partly due to your labor and partly to the saw, for each is indispensable. As the owner of the saw either made the tool himself or bought it with other products of his labor, other labor than your own enters directly into the building of the bench. In economics the saw is called *capital,* as it is a product of past labor used for further production, and the reward to which the owner of it is entitled is *interest.* Ordinarily we think of capital as money, but if your neighbor lends you money to buy a saw he is in effect lending you a saw; the reward is interest, whether the saw or the money is loaned, the word *rent* being restricted in economics to land. The conflict which goes on the world over between capital and labor is only an enlargement of the difficulty which you and your neighbor will have in determining a just interest for the saw.

Over the third factor, land, there is less dispute, principally, no doubt, because land owners and capitalists in many countries are as a rule the same people. Nevertheless, by some economists most of the poverty in the world is ascribed to the institution of private ownership of land, which is not, like capital, the product of past labor.

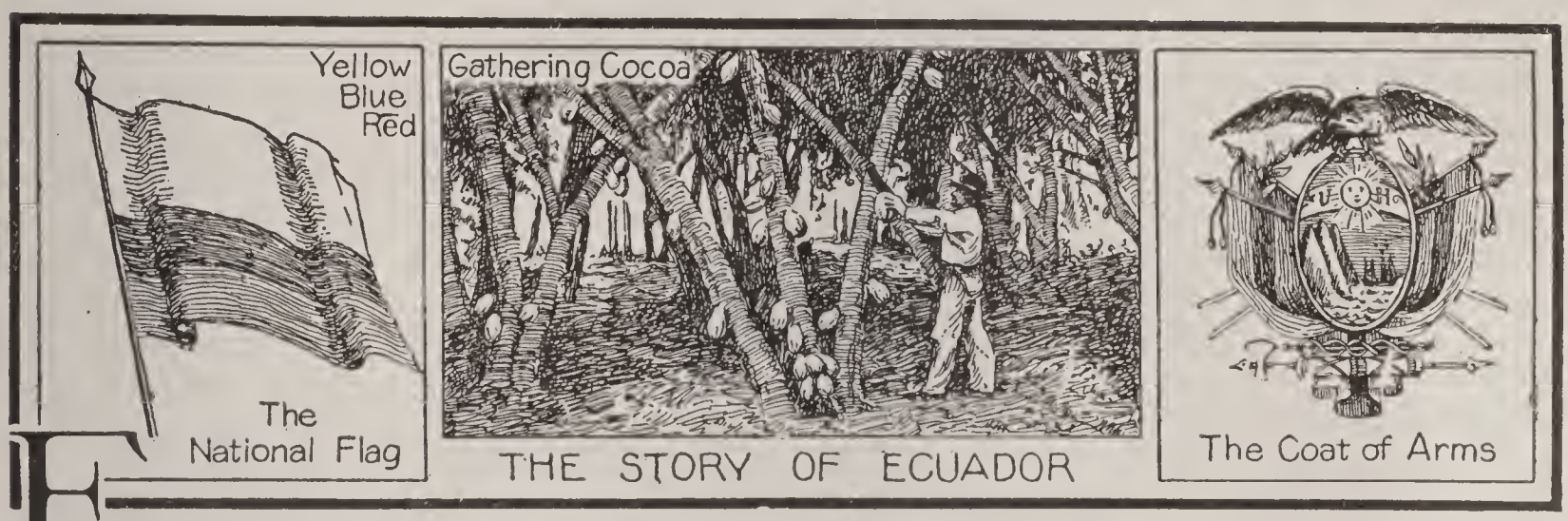
Supply and Demand. In general, as economics shows, value is regulated by supply and demand. Thus diamonds, though not so useful as potatoes, are more valuable because the demand for them always exceeds the supply, while there are usually enough potatoes for all. Demand and supply act and react throughout all industry. Suppose the supply of laborers in a country becomes scarce; wages then rise. In one business, let us say clock-making, most of the manufacturers find that if they pay an increased wage in order to secure men they will lose money. Therefore they leave the clock-making business, and as a result there are fewer clocks made. At first this gives greater profits to clock-makers who have remained in the business, for they are able to charge higher prices. But the increased profit attracts other men to making clocks, and soon the supply is greater than ever. This may result in two things: (1) a greater cost of making clocks, due to the increased demand for labor and materials; (2) a lower selling price for clocks. This again reduces the profits and drives out the weakest clock-makers. But it does not bring us back to our starting point, for the low price of clocks means that people who never owned them before can now buy them, and this increased demand is sufficient to keep some of the new manufacturers in the business and eventually to lead others into adopting it.

Money. You and your companion on the island would find little difficulty in dividing your berries and eggs. But if the castaways numbered fifty you would no doubt find it necessary to adopt some system of shell money. Money, as economics teaches, exists as a help in exchanging the products which we make for one another, but too often we think of it as a thing to be desired for itself. On the contrary, the presence of too much money in a country may be harmful. After the Franco-German War of 1870, France was obliged to pay to Germany an indemnity of about $1,000,000,000 within three years. When, as a result, the supply of money became less in France, its value became greater, and a franc went farther in wages than before. In Germany, of course, the reverse was true. Thus, because of the high wages they had to pay, German manufacturers were not able to sell their goods to the world as cheaply as the French could sell them, and the world witnessed what Bismarck called an absurd miracle—France prosperous and Germany in difficulties because of their respective loss and gain of money. (The subject of money is fully treated under its own title.)

C.H.H.

Related Subjects. For the guidance of those who wish to review or study the entire range of economics there are presented below, in alphabetical order, all the topics relating to the subject which are discussed in these volumes:

Annuity
Bimetallism
Blacklist
Bounty
Boycott
Budget
Capital
Collective Bargaining
Communism
Conservation
Consumption
Coöperation
Corn Laws
Corporation
Credit
Customs Duties
Debt
Eight-Hour Day
Embargo
Emigration
Employers' Liability
Factory and Factory System
Famine
Free Trade
George, Henry
Gresham's Law
Income Tax
Inheritance and Inheritance Tax
Interest
Labor, Division of
Labor Organizations
Minimum Wage
Money
Mothers' Pensions
National Debt
Old Age Pensions
Open Shop
Pauperism
Pension
Peonage
Population
Profit
Protection
Rebate
Reciprocity
Rent
Single Tax
Socialism
Statistics
Strike
Supply and Demand
Sweatshop System
Syndicalism
Tariff
Tax
Tenement
Trusts
Usury
Value
Wages
Wealth



ECUADOR, *ek'wa dawr,* a centralized republic in the northwestern part of South America. In shape it is a triangle, with its base on the Pacific Ocean. Its name, which was once Quito, is now the Spanish form of the word *equator.* The area of Ecuador has been estimated at about 116,000 square miles of mainland and 2,400 of islands, a total of 118,400 square miles. It is therefore about twice as large as Georgia or a little less than half the size of the province of Saskatchewan.

Ecuador is unusual among tropical countries for the reason that, while it lies directly across the equator, it is habitable by white people because of its elevation. Other lands crossed by that line are generally unsuited to be the homes of the white man; but the table-lands of Ecuador enjoy the delight of never-ending spring.

The islands (Galapagos) possess a peculiar interest for the scientific world, because of the voyage of the *Beagle* (1831-1836), which enabled Charles Darwin to "reveal a new world" by his study of the native animal and vegetable life, the species of which had become multiplied through the separation of the islands since their formation. This voyage has been compared to that of Columbus, since it led to the discovery of the origin of species and revolutionized the science of the world.

The People and Their Cities. Of the population of Ecuador, estimated at 1,500,000, the white people and the *metizos* (persons of mixed blood) constitute scarcely more than a quarter, fewer than 500,000. When we speak of the great majority in that country as "Indians," we must divest ourselves of the idea of wandering tribes of barbarians. At the time of the Spanish conquest four centuries ago, the country was highly civilized on the Inca plan, though it had little in common with European civilization. See INCA.

LOCATION MAP
Showing the position of the republic, and the proportion of the continent occupied by it.

The aboriginal people of Ecuador were industrious and orderly, and their descendants to-

day possess these virtues in a high degree. They believe in education and have not only provided it, but have made it compulsory. Their police service is one of the most efficient in South America. Appreciation of literature and art is shown in their national library, astronomical observatory, conservatory of music, school of fine arts and school of arts and crafts, as well as in their public statuary and in much of their architecture. Ecuadorians have upheld the gold standard of money; have caused their condor (gold piece) to conform in value to the British pound sterling ($4.86) and have been solicitous to maintain public credit. In art they are famous for their sculpture and painting.

Quito, the capital, and Guayaquil, the chief port, are nearly equal in size, Quito being somewhat the larger and containing about 80,000 inhabitants. Cuenca, in Southern Ecuador, has about half the population of Quito. To reach Quito railway coaches have to ascend a distance of nearly two miles; the traveler has in this an experience unparalleled elsewhere in the world.

Communications. Nearly all travel in Ecuador starts from the harbor of Guayaquil, to which British, German, Chilean and North American vessels make regular visits. The voyage from Panama to this port is made in three or four days, and can be considerably shortened by fast steamers. Before the opening of the Panama Canal few vessels from the Atlantic ever braved the 10,000 mile voyage around the "Horn" to Ecuador. In 1922 there were fewer than 425 miles of railway in the republic. The railway to Quito, the capital, was completed in 1908; another, to connect the Bay of Caraquez with the capital, was under construction in 1916 but not finished in 1922. Other lines are under construction or are planned. Where there are no railways, travel and transportation are slow and difficult by reason of the nature of the country.

COMPARATIVE AREAS

In addition to comparisons made in the text, note that Ecuador (without its islands) is nearly as large as Ohio, Indiana and Kentucky.

Physical Features and Climate. The lowlands of the coast region are oppressively hot, but are well suited to the cultivation of cacao, cotton, sugar-cane, coffee, tobacco and tropical fruits.

There are three successive ranges of mountains, rising from the lowlands of the coast and increasing in height to the eastward. The middle range expands into a high plateau, varied by occasional high peaks. This plateau is suited to the cereals and vegetables of the temperate zones. The mountain regions are rich in a variety of ores, including gold, mercury, copper, iron, lead, platinum and silver, though some of these have not been worked. Coal and oil exist in paying quantities, and await development. Large deposits of sulphur are found in the volcanic regions and on the islands.

The *montaña,* or wooded tract, occupies the eastern slope of the Andes. The extensive forests of this region contain many trees of special and peculiar value, such as the *hevea,* which produces the best rubber; the *phytelephas,* which supplies the nuts of vegetable ivory; the *cinchona,* whose bark yields quinine; the silk-cotton tree, from which the French have recently perfected their manufacture of a delicate silk; and the *carludovia,* which supplies the fiber for Panama hats.

Of the mountains, Chimborazo is the highest, rising to a height of 20,608 feet above the sea level. Cotopaxi is one of the most remarkable volcanoes in the world, scarcely approached in terrible sublimity, its thunders being heard at times for hundreds of miles.

Of the limited native animal life of Ecuador, North Americans are generally familiar with the name of—

> "That proud bird,
> The condor of the Andes, that can pierce
> The illimitable expanse of heaven's blue,
> And bathe its plumage in the thunder's home."

of which George D. Prentice wrote in *The Closing Year.*

The Galapagos Islands have but little value, and contain only 500 people. They are famous for their enormous tortoises, on which grown men can ride.

Religion. Ecuador is intensely Roman Catholic. The liberal element is within the Church, not without; and the strongest opposition to clerical influence comes from Catholics themselves.

Commerce. Whether in the matter of imports or of exports, the United States is the second among countries trading with Ecuador; Great Britain supplies the most imports, and France takes away the most exports. Before

the War of the Nations Germany stood third in regard to both. Ecuador supplies one-third of the world's cacao (chocolate). Vegetable ivory, supplying an excellent substitute for the ivory of elephants' tusks, is used chiefly for making buttons, and has been largely taken by Germany. Panama hats are manufactured chiefly in the province of Manabi. More than a million pounds of rubber is produced annually. Excellent coffee is raised, and of this the surplus above home consumption is taken chiefly by Chile.

Commercial Possibilities. Ecuador is a land of opportunity. Much attention has been called to the opening for cattle raising. Mining has been but little developed, as yet. The Panama Canal and the railway to Quito having rendered the capital easily accessible, the region of eternal spring offers superior attractions to tourists, and the South American call for "American" hotels applies here as elsewhere. Shoes are made by hand in Quito, and much of the manufacturing is done on a small scale. With railways to build, mines to develop and forest products to be gathered, there is excellent opportunity for the investment of capital.

History. The kingdom of the Quitus, on the equator, was perhaps 1,200 years old at the time of the Peruvian conquest in 1460. In 1533 there was a change of masters, for the Spanish seized the country. Independence was secured by the Battle of Mount Pichincha (nearly two miles above the sea level), in 1822, by the patriot leaders, Sucre and Santa Cruz. At first united with New Granada and Venezuela, Ecuador became a separate republic in 1830.

This little republic has been one of the most turbulent states in the world. As a rule its only peaceful days have come when some one man has been strong enough to make himself dictator. The struggle of the patriots against the corrupt rule of the clerical interests has lasted from the foundation of the republic to the present century. President Gabriel Moreno, a despot who bowed only to the clergy, was assassinated in 1875. The constant revolutionary intrigues of the Church party provoked President Plaza in 1904 to declare all churches on an equal footing and finally to confiscate Church property. In 1905 the clericals elected their candidate, but he was driven from office by Ex-President Alfaro. In 1912 Plaza seized the Presidency, and after defeating the opposition, handed over the gov-

Outline and Questions on Ecuador

I. Position and Size

(1) Latitude
(2) Longitude
(3) Actual area, 116,000 square miles
(4) Comparative area

II. Physical Features

(1) Coastal lowlands
(2) Mountain section and plateaus
  (a) Great peaks
(3) The *montaña*
(4) Climate
  (a) Dependence on altitude

III. The People

(1) Predominance of Indians
(2) Other races
(3) Attitude toward education
(4) Religion
(5) Cities

IV. Industrial Development

(1) Agriculture—main industry
(2) Unworked mineral resources
(3) Limited manufactures
(4) Communication and commerce
(5) Opportunities for development

V. History and Government

(1) Antiquity
(2) Spanish conquest
(3) Republic established
(4) Recent development

Questions

What does the name *Ecuador* mean?

Why would you rather live in Ecuador than in most tropical countries?

What did certain possessions of this country have to do with one of the most noteworthy voyages in the world's history?

Who are the *mestizos?* What race makes up the greater part of the population of the country?

What indicates the attitude of the government toward education?

About how long does it take to go from Panama to the chief port of Ecuador?

How long a stretch of railway is there to each hundred square miles of area?

Look on the map of South America for Quito. Considering its latitude, how can it be called the "City of Eternal Spring"?

What part of the dress or suit you have on may well have come from Ecuador?

Is the highest mountain in the country as high as the loftiest peak of the United States? Of Canada?

What characteristic form of animal life has given its name to the monetary unit of the country?

Of what important commodity does Ecuador produce more than any other country in the world except one?

ernment to his elected successor, Alfredo Moreno, in 1916.

Other Items of Interest. Though Ecuador as a republic is over eighty years old, it has never had a general census.

The interest of the national government in education may be seen from the fact that about twelve per cent of the annual budget is devoted to educational purposes.

Among the countries of the world, only the Gold Coast, in Africa, produces more cocoa.

The Andes region is far from stable; it has been estimated that Quito and the surrounding territory sank twenty-six feet during the nineteenth century.

Quito, the capital, is known as "the City of Eternal Spring," and it deserves the name.

Chimborazo has no fewer than eleven true glaciers, some of them very large.

One of the most interesting of the mountains of Ecuador is the volcano Pichincha, which is situated not far from Quito. Some of its eruptions have been most destructive to the capital city, but the last one broke down the western wall of the crater, and it is believed that this will save Quito in case of further eruption.

The present constitution of Ecuador dates from 1906. It places the executive power in the hands of a President who is elected for a term of four years by the direct vote of the people. He may not succeed himself. H.M.S.

Consult monthly bulletins of the Pan-American Union, Washington, D. C., obtainable on application; Enoch's *Ecuador.*

Related Subjects. The following articles in these volumes will be helpful to the reader who is interested in Ecuador:

Andes
Chimborazo
Chocolate
Cocoa
Coffee
Cotopaxi
Galapagos
Guayaquil
Ivory Palm
Quito
Rubber and Rubber Manufacture

ECZEMA, *ek'ze ma,* one of the commonest skin diseases, which includes from one-third to one-half of all cutaneous affections. It is characterized by intense itching and an oozing of serum which forms crusts and scales. It may be acute or chronic in its course. The external causes of eczema are acids and poisons and animal and vegetable parasites. The internal causes are mainly scrofula, gout, wrong diet and the use of alcoholic beverages. Eczema is sometimes called *salt rheum,* from an old belief that it is a humor of the blood. Treatment of eczema should be both external and internal, but only under care of a physician. Treatment without the watchfulness of the doctor may multiply its dangers. W.A.E.

EDDA, *ed'ah,* a title applied to two ancient works in Scandinavian literature, known as the Elder, or Poetical, Edda, and the Younger, or Prose, Edda. The first of these, ascribed to Saemund the Wise, was compiled some time between the tenth and the thirteenth centuries, and consists of thirty-three songs, which treat of the Scandinavian gods and heroes. The Prose Edda is ascribed to the Norse historian and politician, Snorri Sturluson, who flourished in the first half of the thirteenth century. It treats of the mythology of the North and of the versification and modes of composition of the *skalds,* or ancient poets. It was intended to serve as a guide to young poets, and was first published in the seventeenth century.

EDDY, *ed'i,* Clarence (1851-), an American concert organist of the present time. His repertoire comprises practically everything that has been written for the organ, to which he gives a masterly interpretation, as well as hundreds of manuscripts which have been dedicated to him. His organ collections are used extensively throughout the world, and his compositions are also renowned. He is a native of Greenfield, Mass., and was educated in America and in Germany. After a successful concert tour in Germany, Austria, Switzerland and Holland, he returned to America and located in Chicago, becoming organist successively in several of the foremost churches. Mr. Eddy's ability both as artist and composer has been recognized by European critics.

EDDY, *ed'i,* Mary Baker (1821-1910), the discoverer of Christian Science and the founder of the Christian Science Church. She was born at Bow, near Concord, N. H., and was educated in the public schools, at Sanbornton (N. H.) Academy and by private teachers. She was of a religious nature, and at an early age was admitted to membership in the Congregational Church, in spite of her inability to subscribe to some of its doctrines. This membership was retained until she founded her own Church.

In 1843 she married George W. Glover, who took her to Charleston, S. C. He died about a year later, and she returned to the home of her parents practically without means; as a matter of conviction she had liberated the slaves her husband had held. Here a son, George W. Glover, was born. As she was in

very delicate health and dependent upon her family, her position was a difficult one. She was always a devout student of the Bible, and in her distress of body and mind she constantly turned to it for relief and guidance, and in 1866, while suffering from a serious accident, she gained the perception of the meaning of the Scriptures which brought about her own healing and gave rise to the religion she founded. Of this experience she afterwards published the following account, which is found in her work, *Miscellaneous Writings:*

> Saint Paul writes: "For to be carnally minded is death; but to be spiritually minded is life and peace." This knowledge came to me in an hour of great need; and I give it to you as death-bed testimony to the day-star that dawned on the night of material sense. This knowledge is practical, for it wrought my immediate recovery from an injury caused by an accident, and pronounced fatal by the physicians. On the third day thereafter, I called for my Bible, and opened it at Matthew IX, 2. As I read, the healing Truth dawned upon my sense; and the result was that I rose, dressed myself, and ever after was in better health than I had before enjoyed. That short experience included a glimpse of the great fact that I have since tried to make plain to others, namely, Life in and of Spirit; this life being the sole reality of existence.

After nearly a decade of work in pondering her discovery, perfecting its statement and proving its worth to her fullest satisfaction, she produced in 1875 her fundamental contribution to the religious and therapeutic thought of the world in *Science and Health, with Key to the Scriptures,* which is the "text-book" of Christian Science. It has gone through numerous editions and has come to be one of the most widely read of books. But one translation, that into German, has been authorized. Among Mrs. Eddy's most important other works are *Unity of Good and Other Writings, Christian Healing and Other Writings,* and the *Church Manual.*

In 1877 she married Dr. Asa G. Eddy, who was associated with her in the Christian Science movement, to which she devoted her life from the time of her healing. In 1879 she organized the Church of Christ, Scientist, which in 1892 was reorganized as The First Church of Christ, Scientist, in Boston, Mass. Of The First Church, known also as The Mother Church, she was pastor for many years.

In 1881 she opened in Boston the Massachusetts Metaphysical College, the only institution of its kind having a charter from the Commonwealth. She founded the periodicals of the denomination, now issued by the Christian Science Publishing Society of Boston, including *The Christian Science Journal,* a monthly; *The Christian Science Sentinel,* a weekly; *Der Herold der Christian Science,* a German monthly; and *The Christian Science Monitor,* a daily newspaper. For a number of years Mrs. Eddy lived in comparative retirement at Concord, N. H. In 1908 she went to Chestnut Hill, a suburb of Boston, where, revered and loved by her many thousands of followers, she remained actively in charge of her large and growing movement until her death, December 3, 1910. See CHRISTIAN SCIENCE.

A.C.

Consult Wilbur's *Life of Mary Baker Eddy.*

EDELWEISS, *a'del vise,* a pure silver-white, star-shaped perennial flower. It is Switzerland's national emblem, and plays an important part in that country's legend and poetry. Due to its rarity, laws protect it there. Appearing in exposed places, high in the Alps of Switzerland, Tyrol, Carinthia, Austria and Serbia, its fame is due chiefly to the difficulty in obtaining it. Thrilling tales are told of the lure of the rare edelweiss. That it can be easily cultivated, however, has been proved by its frequent appearance in American and European gardens. The plant grows about six inches high. Its compound flowers are surrounded by small, woolly flower-leaves (bracts) and sage-green foliage leaves. Almost any soil, not too rich and fully exposed to the sun, will produce edelweiss plants, for the woolly covering enables them to hold moisture and endure exposure.

THE EDELWEISS

The word is from the German, and means *noble white.*

EDEN, *e'd'n,* GARDEN OF. In the Bible is told the story of the creation by God of a beautiful garden to be the home of the first human beings. Adam and Eve were put into it and were told that it would be their home as long as they did not disobey God by eating of the "tree of knowledge of good and evil." One day the Maker found that they had done what he had told them not to do, so he put them out of the Garden. The story is told in the book of *Genesis.* Many scientists have tried to locate the place, but probably the Flood materially changed the surface of the earth so it is only guess-work to assume that it was in the valley of the Euphrates River of to-day, as many people assert.

The Garden of Eden meant a place where everything was joy and happiness, and as such is used figuratively in literature to-day. Shakespeare in *Richard II* refers to England as—

> This earth of majesty, this seat of Mars,
> This other Eden, demi-paradise.

EDENTATA, *e den ta'tah,* a small group of animals which do not have teeth in the front of their mouth and therefore live on insects and animal substances in a decaying state. The ant-eaters and pangolins have no teeth at all, while the rest in this group, such as the sloth, armadillo and aard-vark, have simple, rootless teeth near the back of their jaws. The majority of these animals live in South America, although some species are found in Africa and Southern Asia. They are slow in their movements, because of the peculiar structure of their limbs; they have large claws, almost like hoofs, and are covered with coarse hairs, which in the case of the pangolin are united into overlapping scales. The edentata are generally ranked as the lowest of mammals, not merely because of the lack of teeth but because the brain is very small and poorly developed. (Each animal named above is described in its place in these volumes.)

ED'IBLE BIRDS' NESTS, the nests of certain species of swifts, found principally in the Malay Archipelago and regarded as a luxury by the Chinese. The nest has the shape of a common swallow's nest, is found in caves, particularly on the seashore, and has the appearance of fibrous, imperfectly-made isinglass. When procured before the eggs are laid, the nests are of a waxy whiteness and are then esteemed most valuable. The best specimens sell in the Chinese markets for about $12 per pound. They appear to be composed of a mucilaginous substance secreted by special glands, and not, as has been previously held, of glutinous seaweed.

EDICT OF NANTES, *nahNt.* See NANTES, EDICT OF.

EDINBURGH, *ed'in bur o,* Scotland's capital and second city, and the center of its intellectual and religious life, is a city rich in memories. Within its boundaries were staged many scenes in the life of Mary Queen of Scots and in the contemporary struggles and success of the great presbyter, John Knox; in one of its churchyards was signed the National Covenant, which established the independence of the Presbyterian Church in Scotland, and in one of its cellars, the Act of Union with England, which ended the independence of the Scottish nation. In later days it was a literary center, the home of the *Edinburgh Review,* one of whose founders was Sydney Smith and among whose contributors were Carlyle, Hazlitt, Macaulay and Scott; of *Blackwood's Edinburgh Monthly,* which published contributions from "Christopher North," De Quincey and Scott, and George Eliot's first stories, *Scenes of Clerical Life;* and of *Chambers's Edinburgh Journal,* whose editors were the publishers of the famous *Chambers' Encyclopaedia* and the *Book of Days.* In Edinburgh, Scott spent his early life, Burns enjoyed his first success, Thomas Carlyle began his career, De Quincey passed twelve of his most active years, and Robert Louis Stevenson grew to manhood. Many scenes in and about the city are familiar to readers of Scott's *Waverley Novels* and Stevenson's *David Balfour.*

Edinburgh to-day is a progressive community of 320,000 people. The city owns its water supply, its gas, its street lighting system and its street cars. The municipal government elects a majority of the curators of Edinburgh University, which, though the youngest of Scotch universities, was chartered in 1582, fifty-four years before Harvard College, the oldest in America. Edinburgh has established public markets and public slaughter-houses, and has built houses which are leased to working people. It is proud of its educational institutions, one of which, the Royal High School, was founded in the sixteenth century.

Edinburgh is built on the hills which rise south of the Firth of Forth, from which its business center is about two miles distant. Until the end of the nineteenth century the boundaries of the burgh did not extend to the shore, and its shipping still passes through the port of Leith. The city is divided into the

Old Town and the New Town by a deep ravine, through which runs Princes Street, said to be one of the most beautiful in the world. In the Old Town only one street is wide enough to admit carriages or automobiles.

Among the interesting sights of the city is Holyrood Castle, parts of which were built eight centuries ago; it was the home of the Stuarts before they became kings of England, and is still occasionally occupied by royalty. A monument unusual for Europe commemorates the Scots who fell in America in the War of Secession. There are two libraries, one given by Andrew Carnegie, the other the Advocates' Library, founded in 1682, of which Hume was for some years librarian.

The site of Edinburgh was settled before Roman times, but it did not bear its present name until the seventh century, when it was seized by the Saxons of Northumbria, for whose king it was called Edwin's burgh. The city's nickname, *Auld Reekie,* means *Old Smoky,* though Edinburgh is not a great manufacturing center.

The University. No one of the other three Scotch universities has been the school of as many famous men as Edinburgh. Barrie, Carlyle, Darwin, Conan Doyle, Hume, Scott, Stevenson, Thomson the poet,—all received at least part of their education in it. The university was originally called the Town's College, for it was established by the Edinburgh Town Council and remained under the latter's direction from its opening in 1583 until 1858. It is now governed by the principal and professors, under the supervision of officers of both town and gown. Degrees are given in arts, science, medicine, law, music and theology. Like other Scottish universities, Edinburgh admits women to all its privileges. It shares in the Carnegie funds, and joins Saint Andrew's University in sending a member to Parliament.

EDISON, *ed'i sun,* THOMAS ALVA (1847-), familiarly known as the "Wizard," is the greatest among the world's inventors, one of the very few men of all time who have devoted their lives to invention as a profession. The work of no other man in the field of electrical science approaches the extent and range of his activities, which have been solely in the direction of devices which have stimulated industry and forced advancement more rapidly in a decade than any other influence in like time in the history of the world.

His birthplace was Milan, O., but the greater part of his boyhood was spent in Port Huron, Mich. He began his career as a newsboy on the Grand Trunk Railway, and his taste for experimenting led him to fit up a small laboratory in a compartment of a baggage car. His experiments were brought to an end by the overturning of a bottle of phosphorus which set the car on fire. He next studied telegraphy, and secured a position as telegraph operator at Port Huron, and later in Canada, on the Grand Trunk Railway. After working a number of years in this capacity he began his career as an inventor in 1869; the stock ticker, the first product of his genius which was of commercial importance, was brought out in that year.

THOMAS A. EDISON
He has been called the most useful citizen of the world.

The World's Debt to Edison. The work of Edison includes so many great inventions and has built up so many industries that it is impossible to point out any one of his triumphs as his greatest. One of his first inventions was a machine for recording votes at elections, but after he had perfected it nobody wanted to use it. He then made up his mind that he would never again spend his time on a device or machine which was not of immediate, practical use. Strict adherence to this rule is the reason why Edison's name is familiar the world over. He has not made great discoveries in theoretical science, but he has applied and developed to new uses the principles which other men have established. A partial list of the industries that have been built up wholly or in part on the inventions of Edison is here given to indicate the scope of his work: Electric lighting, brought to its high efficiency through his genius; manufacture of incandescent lamps; manufacture of electric fixtures; the development of electric railways; manufacture of dynamos and electric motors; the telegraph, the efficiency of which he has wonderfully increased; moving pictures; manufacture of the phonograph and the various forms of talking machine that have sprung from the phonograph.

Edison's inventions are the result of almost ceaseless industry and an active imagination.

To a flatterer who once tried to compliment him on his achievements, Edison replied that "Genius is about two per cent inspiration and ninety-eight per cent perspiration." When he works, which is nearly all the time, he becomes unconscious of time and place. His absorption is at times so intense that it is necessary for someone to remind him that he must eat or sleep. He has said that up to 1902 he worked an average of nineteen and one-half hours daily; since that time his working day has averaged eighteen hours. His habit is not so much to do without sleep as to "sleep when he wants to," as he puts it. He has worked practically without sleep for sixty hours, after which he has taken sleep lasting eighteen hours or more and awakened fully refreshed.

When a task is completed and he seeks a vacation he plays as hard as he has worked and drives care entirely from his mind. When he has conceived a new idea he reads everything obtainable relating to the subject; then, with the aid of his assistants, he makes a series of tests, sometimes hundreds, sometimes thousands, of them, no test being omitted that will aid in finding the best device for the purpose. One of the best examples of Edison's method in invention is the incandescent lamp; this is explained in the article Electric Light.

Edison's part in the development of the electric railway consists principally of his invention of a dynamo that is self-regulating, giving out more current to the line when more current is needed without change of voltage —the compound wound dynamo. Such a dynamo will furnish current for one car or for a number of cars and adjust itself automatically to the load that it is called on to carry.

The moving-picture camera and the machine for showing moving pictures on the screen are both inventions of Edison. The difficulty which he overcame in perfecting the moving-picture camera was that of making twenty pictures a second in one camera. By means of the phonograph and the moving-picture machine he has provided entertainment for millions of people and opened up vast possibilities in the field of amusement and education. By a process of combination, in 1914, he developed a machine which would not only show the moving pictures but present dialogue to accompany the action of the plot. This machine showed defects, and it was recalled to undergo further study and experimentation.

Edison's industry in invention is well illustrated in his development of the storage battery that bears his name. After a long series of tests, when the storage battery appeared to be a success, it was put on the market, but Edison continued to experiment with a view to improving it. After several thousand cells had been sold it was found that occasionally a cell would prove defective. The customers were satisfied, but Edison was not. He shut down the factory, though it meant great loss, and for five years conducted experiments with the determination to improve it. The result was even better than he expected, and again the Edison battery was put on the market.

In the field of telegraphy Edison invented systems of duplex, then quadruplex and finally sextuplex transmission; this means that two, four and now six messages can be sent over one wire at the same time. In the telephone field Edison is the inventor of the carbon transmitter, which in a modified form is used to-day in practically all telephone systems. After the beginning of the War of the Nations in 1914 Edison devoted considerable time to perfecting processes for making carbolic acid, benzol and other materials previously imported from Europe and not manufactured in America.

The number of Edison's patents is more than 2,500; about 1,400 of these are registered in the United States, and nearly 1,200 in other countries. His laboratories and factories are in Orange, N. J., a few miles west of New York City. Edison belongs not to the United States alone, but to the world, and his modestly-won honors are from many nations. In 1878, when his genius was in what proved its early stages of development, he was given the appointment of Chevalier of the Legion of Honor from France, and fourteen years later was made a Commander in the same Order. In 1892 Great Britain honored him with the Albert Medal of the Society of Arts. In 1917 his services were drafted by the government; he was also appointed chairman of the Advisory Board of civilian inventors and engineers to consider plans for raising the efficiency of the United States navy. While he appreciates the honors bestowed on him he will never wear medals, for a characteristic of Edison is his dislike of display. Often visitors who have taken medals to him have been met with what appeared to be scant courtesy. At one time a visitor called at his laboratory with a medal to present to Mr. Edison and asked him if he had any more. "Oh yes," he replied, "I have a couple of quarts more up at the house." His apparent

bluntness meant only that his work was of more importance to him than any number of medals. W.F.Z.

Consult Jones's *Thomas Edison;* Dyer and Martin's *Edison: His Life and Inventions.*

Related Subjects. The importance of Edison's work can be best appreciated through a study of the following articles in these volumes:

Dynamo	Nobel Prize
Electric Light	Talking Machine
Electric Railway	Telegraph
Moving Pictures	Telephone

EDMONTON, *ed'mun tun,* the capital of the Canadian province of Alberta, one of the great cities which have sprung up on the western prairies almost in a day. For more than a century Edmonton was a trading post. It was prosperous enough, considered as a trading post merely, but it made almost no advance in size or importance. During the closing years of the nineteenth century there came a sudden change, and from a cluster of buildings scarcely worthy the name of village Edmonton was transformed into an important town. In another decade it became a great city—with the exception of Calgary, its rival to the south, the largest between Winnipeg and the Pacific coast.

It is a city with wide streets and boulevards, with fine homes and substantial business blocks, with banks, hotels, theaters, churches, colleges and excellent public schools, with railways, street cars and automobiles. In short, a city with all the comforts and advantages of modern life blossomed forth from the little trading post which stood on the banks of the Saskatchewan, a rendezvous for Indians and the few white men who carried on the business of the Hudson's Bay Company. From a population of 1,200 in 1899, Edmonton jumped to 2,626 in 1901, to 24,900 in 1911 and to a total of 58,821 in 1921. It thus has reached the status of the ninth city in size in the Dominion.

Location and General Description. Edmonton lies slightly south and east of the geographical center of the province, but is well to the north of the center of population. The preponderance of population in the south and south center, due to earlier railway development in these sections, has caused Edmonton to be considered as situated far north, but in reality it is well within the southern half of the province. It is about as far north of the equator as Berlin, Germany, and is slightly farther north than London, England. The city lies on the banks of the North Saskatchewan River, which at this point has cut a valley 200 feet deep and nearly a mile wide. The river itself is nearly 700 feet wide. On the table-land which overlooks the thickly-wooded river valley lies Edmonton. Edmonton South, that portion of the city south of the river, was formerly a separate city, called Strathcona, but since February, 1912, has been incorporated as a part of Greater Edmonton.

The Basis of Edmonton's Growth. The Saskatchewan River is navigable for steamers from Edmonton to a point about four miles above its mouth in Lake Winnipeg, a distance of about 850 miles. A series of rapids at that point breaks the course of navigation and has retarded the development of river traffic. Edmonton's prosperity is due largely to the railways. The Canadian Pacific, the first railway to cross the prairies, ran through Calgary, 194 miles to the south, and it was not until 1891 that a branch was extended from Calgary northward. This branch stopped at South Edmonton, on the south bank of the Saskatchewan. The Canadian Northern, the first railway to reach Edmonton proper, arrived in 1905, and in 1910 came the Grand Trunk Pacific. Two other railways, not yet completed, will open new territory tributary to Edmonton and also provide additional connections to the coast; these are the Edmonton, Dunvegan & British Columbia and the Alberta & Great Waterways railways. By the shortest rail routes Edmonton is 793 miles northwest of Winnipeg and 773 miles northeast of Vancouver.

Industries and Commerce. Edmonton is both a manufacturing and a commercial center. Its chief industrial plants are slaughter- and packing-houses, lumber mills, clothing manufactories, foundries and biscuit factories. Coal mining, near the city and even within the city limits, has grown to great proportions. To a large degree the city trades in the products of its mills and factories, but it is also a large distributor of machinery and other supplies for the mines and farms. Edmonton is the natural center for the valley of the Peace River and is the gateway to the Mackenzie basin. It is also one of the world's greatest fur markets, being the headquarters of the Hudson's Bay Company, of Revillon Frères, a great French firm, and other smaller organizations.

Conspicuous Features. The city's chief educational institutions are the provincial normal school, the University of Alberta (which see), and Robertson and Alberta colleges, which are affiliated with the University, and the Jesuit and

Oblate Fathers' colleges. The public schools are well housed and equipped; such buildings as the Victoria High School and the John A. McDougall School might well be the pride of cities many times as large. The Edmonton Technical School deserves special mention. Of the many public structures the most conspicuous is the beautiful provincial Parliament building (for illustration, see ALBERTA, page 157), but also worthy of notice are the new Government House (Glenora); the Chateau Macdonald, a magnificent hotel completed in 1914 at a cost of $2,000,000; the courthouse; the civic block, which houses all the administrative offices of the city, and the McLeod building.

Edmonton is conspicuous among Canadian cities as one of the leaders in governmental reforms. It owns and operates all of its public utilities, including street railways, water works and telephone, electric light and power systems. It raises its public funds by a "single tax"; with the exception of a few license fees and special taxes for local improvements the only tax levied is on land. It has a modified commission government, the mayor being assisted by one city commissioner. One of the latest innovations, established in 1916, is a special court, presided over by a woman judge, to hear cases in which women and children are the culprits.

History. Fort Edmonton, a trading post of the Northwest Company, was established about 1795, and a few years later the Hudson's Bay Company established a station near-by. A small settlement grew up, but gave few indications of its future greatness. In 1876 the telegraph reached Edmonton, and in 1880 the first newspaper, the Edmonton *Bulletin,* was established. The small hand press, on which this first paper was printed, was brought across the plains from Winnipeg in a Red River cart, a vehicle usually made entirely of wood, drawn by an ox or an Indian pony and creaking horribly as its wooden wheels turned on its wooden axles after the rough trails had worn away the grease. The completion of the railway from Calgary in 1891 was of great importance, but is overshadowed by the fame Edmonton won in 1897 and later years as an outfitting point for the goldseekers who thronged to the Yukon and Alaska. In 1905 the city became the capital of the new province of Alberta. J.MC C.

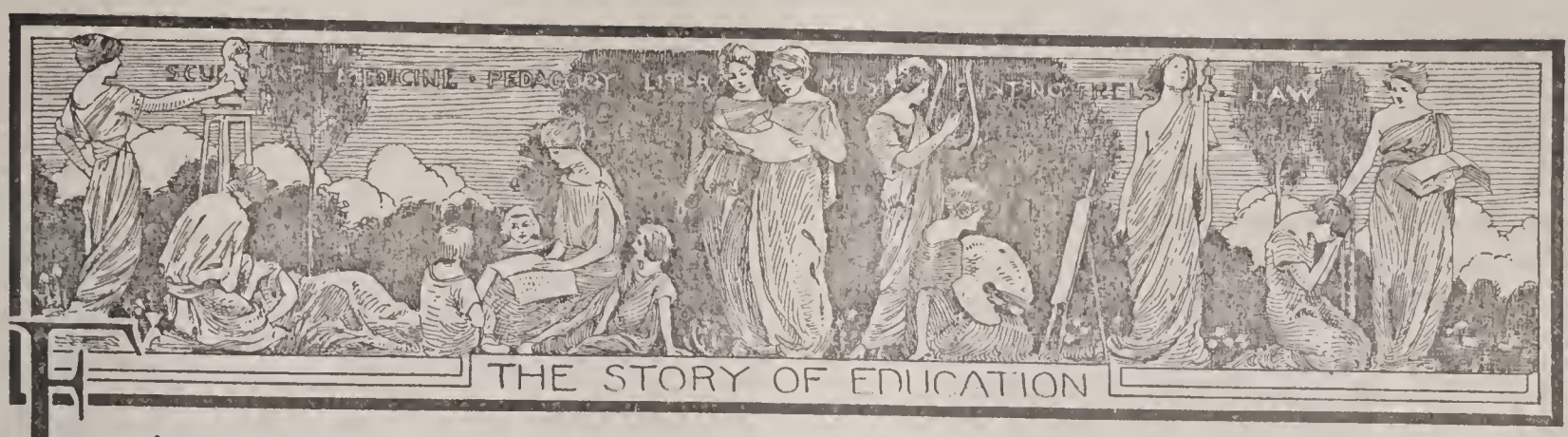
ED'MUNDS, GEORGE FRANKLIN (1828-1919), an American statesman and great constitutional lawyer, was born at Richmond, Vt. He began the practice of law in 1849 and in 1851 removed to Burlington. From 1854 to 1860 he was a member of the Vermont legislature, being for the last three years the speaker of the house. In 1866 he took his seat in the United States Senate as a Republican from Vermont and was returned to that body for four successive terms, succeeding Vice-President Arthur as president *pro tempore* of the Senate after Arthur was elevated to the Presidency by the death of President Garfield, in September, 1881.

During his long term in the Senate he served on the most important committees, taking high rank as a statesman. He came into unusual prominence as the champion of a bill passed in March, 1882, for the suppression of polygamy in Utah. In 1880 and 1884 he was an unsuccessful candidate for the Republican Presidential nomination. He was the author of the anti-trust law, known as the Sherman Act, which was passed in 1890 and became one of the most important Congressional measures of the last half of the nineteenth century.

ED'MUNDSTON, the county town of Madawaska County, New Brunswick, in the northwest part of the province, at the confluence of the Madawaska and Saint John rivers, the latter being at this point the boundary between Maine and New Brunswick. The town is served by the Canadian Pacific, Grand Trunk Pacific and Temiscouata railways, and on the American side of the river is the Bangor & Aroostook Railway. The river valleys north and west of Edmundston are lumbering regions, and the town's chief industrial establishments are saw mills. There is also a large repair shop maintained by the Grand Trunk Pacific Railway. Mixed farming is carried on in the neighborhood, and good fishing and hunting abound. French-Canadians predominate in the town and vicinity. Population, in 1911, 1,821; in 1921, 4,035. J.A.B.

EDOM, *e'dum,* a mountainous region mentioned in the Old Testament, located in modern Syria, lying on both sides of the River Arabah and extending from the southern part of the Dead Sea to the Gulf of Akabah. The country was called Mount Seir until the Edomites, the descendants of Esau, drove out the Horites and occupied the land themselves. It is noted for its red sandstone cliffs, and some have thought that the name *Edom,* which means *red,* was given to the country because of the color of the cliffs.

NEW YORK EDUCATION BUILDING. The most beautiful building erected by any state for its Department of Education. The portrait is that of former Superintendent Andrew S. Draper, through whose efforts it was built.



EDUCATION, *ed u ka' shun.* Ever since man appeared upon the earth the race has struggled to overcome its environment, and the progress from savagery to the present state of civilization of the most enlightened peoples is due to this struggle. Education, in the broadest meaning of the term, means the development of all the powers of man; in the restricted sense in which the term is ordinarily used, it means the training of children, youth and adults in educational institutions—common schools, colleges, universities and professional schools. In the broadest application of the term, education extends through life; in its restricted application, it is confined to the school age, which may extend from four to twenty-five years, if the kindergarten and professional schools are included.

A study of the definitions of education shows that theories and systems have undergone radical changes during the last century. The older definitions emphasize the idea of education through external conditions and powers. The modern definitions, while recognizing the value and influence of these conditions and powers, place emphasis upon the necessity of the self-activity of the learner. In other words, it is only as the learner himself uses these conditions that he becomes educated, through their influence. The educational systems of the past are of interest only to those who desire to study the evolution of educational systems; there are many volumes devoted to this phase. The modern tendencies of education are of present interest, and are set forth in the subtitles which follow.

Natural Education

The term *natural education* is applied by Winifred Sackville Stoner to a volume in which she gives in detail the methods employed in the early instruction of her daughter Winifred (see STONER, WINIFRED SACKVILLE). It has attracted widespread attention because of the very early age at which the child mastered the studies taught in the elementary and high schools, including several foreign languages, and also a number of accomplishments such as playing the piano and violin, painting, and boxing and fencing. The term is now used by Mrs. Stoner to designate her methods, which she holds are better adapted to child nature than those ordinarily employed in school instruction. She has established several schools in which her methods are being applied, and she has thus summarized these measures:

The name *natural education* has been chosen deliberately to designate a new sort of education, the kind which Nature surely intended for all her children—education through play, directed toward a definite end throughout life. All children and all grown people love play, but they restrict the word to a much narrower meaning than is either necessary or desirable. Play is a word that should be made to include anything which one does under the leadership of interest. To be compelled to study or to engage in certain occupations when interest is utterly lacking, is *work.* If the interest is sharply engaged, it is *play.* The pathway of knowledge for children should be one of joy and not one of drudgery. But in order to give little ones a thirst for knowledge, in order to stimulate and not to dull the eager curiosity which every normal child has from birth, training can hardly begin at too early an age.

And since the schools do not care for children during the earliest and probably the most impressionable years, this, their first education, is in the hands of the parents. Now, parents need to be trained for the task. They cannot go at it blindly or they will falter. There must be schools for parenthood so that both young men and young women may learn how best to care for their babes. There should be parenthood training classes in every high school and every college, where all young people could be trained to realize the joys and rich

possibilities that come through fatherhood and motherhood.

Mother Nature has seen to it that her children shall care more for babies than for their studies of the many "ologies" and "isms," for she has put into the heart of every human being the mother love and the father love that make them care tenderly for their children. Plants and animals do not develop best when they are allowed to grow like weeds. All the time and thought put into cultivating them produces a finer product. Why, then, should children be allowed to grow like weeds during their most impressionable years? It is wasting precious opportunities to neglect them for the first six years of their lives and then to deliver them for training to the overworked school teacher.

Every normal child born into this world is a trinity—mental, physical, moral—and every part of that trinity should be developed while the mind is like wax and the impressions made on it are lasting. The mother who develops only the physical part of this trinity makes of her child a sturdy little savage. The parent who develops the mental at the expense of the physical goes against the laws of nature and is sometimes rewarded by a replica of the old-time literary celebrity with begoggled eyes bent back, contracted chest, and pale, sad countenance. Other parents are blind enough to develop the moral and spiritual side of their children at the expense of the mental and physical. All three are wrong. Let moderation in all things be the watchword of parents.

Every normal child born into this world has some special talent given to him, some aptitude for a particular art or profession or occupation. "Why, then," some will ask, "are there not more famous people in the world?" Just as a multitude of good things can be attributed to mothers, so must these same mothers shoulder the blame for many omissions. They should be alert for signs of their children's talents at an early age, ready to nurture them until they bear glorious fruit. The school age, six years, is all too late. Earlier development will do much to bring out this talent; for the child's mind has all the foundations for good or ill, greatness or lowliness, before the school age, and parents must see to it that the foundations are strengthened, not undermined.

History tells us that nearly all great men have shown signs of their wonderful talents almost in babyhood. Julius Caesar was only three years old when he rode to war behind his Uncle Marius. Napoleon played his childish games with imaginary warriors, and Alexander the Great, when his father was absent, went out to parley with the ambassadors. Confucius played on the lute and talked of piety when he was a mere babe, and John Stuart Mill was hardly older when he knew the Latin and Greek alphabets. The exceptions to this rule early rebelled against school and the uninteresting quality of their studies, and, if we knew more of their early lives, we would probably find that there was some just cause for their rebellion—some reason why the fairy, "Interest," was not present to make play of their work.

Children from two and a half to three years of age are at their keenest, bubbling over with energy and curiosity. It is almost criminal to allow this interest and curiosity to spend itself without results. This is the period when the most promising children are likely to leave destruction in their pathway simply because their excessive energy is undirected. Play, as we know it, is not enough. Play without a purpose is mere idleness, and Nature never intended any of us for idleness. But play with a purpose, well-directed play that develops all of a child's capacities, physical, mental, spiritual, will benefit both the child and those about him.

Nature has endowed the child with an eager curiosity, with a desire to touch and taste and handle everything around him, and, as soon as he has acquired the art of speech, to ask innumerable questions. These questions should be answered by mothers and fathers. It requires intelligence and quick thinking and infinite patience to satisfy the thirst for knowledge that children possess, but it is a duty that cannot be shirked. Mothers of the animal kingdom train their young to do all the things that they themselves can do. How many mothers of our race have the patience to do as much? How many of them are as painstaking as is mother Tabby with her kittens? And if their failure is due to their inability to answer all the questions, then they must seek to acquire more knowledge. It is their duty to go to the books, which are still closed to very young children, and there to find answers for them. What are books for—the encyclopedias and the dictionaries, all the stored-up knowledge of the ages—if they cannot tell the child, through his parents, what he wishes to know? Such study serves a twofold purpose, for parents cannot gain the knowledge they wish their

children to have without at the same time benefiting themselves. This is directly in line with one of the Natural Education principles, "We know that which we impart."

Natural Education is not a stuffing process, but one of its purposes is to fill children's minds with thoughts worth remembering at a time when they can memorize with the greatest ease—that is, from the second to the twelfth year. Winifred Stoner was given a useful store of information, or at least a foundation on which she could reason, before she reached her thirteenth year. When she entered the adolescent period she was allowed to follow her own inclinations as regards study.

Most children in the adolescent period are in the high school, at work which is much more difficult for them than any they have had previously. During this time of life, when they are neither little folks nor grown-ups; when they are in a dreamy rather than an active state; when they are changing from grubs to butterflies, they should not be forced to study. The information which seems to them dull and uninteresting might all have been given to them before this time. They might have acquired in early childhood the knowledge which, during their high school years, they feel it drudgery to gain.

But education of this sort cannot be given in large classes. Individual training is the ideal—training through which knowledge may be gained in a few months which now requires years of time. There are no two things exactly alike, not even two leaves on a tree or two blades of grass. Why, then, should we expect children to be so much alike that our son should be made to learn all things and to do all things in exactly the same way in which our neighbor's son learns them and does them?

Nature never intended that her children should be put within brick walls, as if they were prisoners, when they are gaining knowledge. It is all wrong. The day will come when the closed schoolroom will be the exception and the out-of-door school, the rule. Nothing in nature is static; everything is dynamic. Why, then, should we have stationary desks and other immovable furniture in the schoolroom? Why should children be compelled to have thirty minutes of geography, then thirty minutes of arithmetic, and so on, at stated times each day? Monotony such as this kills interest, and when interest is gone the acquisition of knowledge becomes painful drudgery. It should be a joy.

Why not introduce games into the public schools which will be so interesting that children will play them after school hours and during vacations—games that will develop both mind and body? Such games would necessitate more playgrounds, to be sure, but the more playgrounds we have the less need there will be for penitentiaries.

All children have a sense of rhythm that expresses itself when they are very young, in their love of nursery rhymes and jingles. Learning, put into jingle form, is much more easily remembered than in the form of prose. Have you never begun the jingle, "Thirty days hath September, April, June and November," when you wanted to be sure of the number of days in a particular month? This is a perfect illustration of the point. There is no reason why all sorts of facts which will be useful throughout life cannot be put into just such form. And the singing of the rhymes and jingles may be accompanied by body rhythms, so that the mental and the physical can go hand in hand, bringing about perfect coördination of mind and muscle. In other words, make a game of the jingles, an active, interesting game.

It is not necessary to buy expensive and elaborate tools and toys for children. The same old dolls and balls and hoops which have always been in the nursery can be used as aids in developing the imagination, teaching rhythm, history, poetry, art. All toys should, however, be of the constructive type. But beware of the destructive toy! Mothers who give their little ones toy swords and pistols are helping to keep alive the war spirit, that menace to civilization. Children must be taught to admire the constructive rather than the destructive, the saver of life rather than the taker. Let school-books contain, not nine-tenths praise for the warrior and one-tenth for the great inventor or artist or poet, but the reverse. Let children be taught to revere the high achievements of peace and not the accomplishments of war.

The best toy that any child can have, a veritable fairy toy, is a typewriter. No better means can be furnished a child for learning to read, to spell, to speak and write good English, to punctuate and to memorize. If he learns to operate his machine well he will develop his hands so that he will not have the same difficulty in playing a piano or a stringed instrument as he would if he came to it with untrained muscles. He may easily teach him-

self to read by means of this good fairy by copying simple lessons from interesting children's books. It is essential that everyone learn to do things for himself, and a typewriter encourages a child to dig out words and to learn their meanings. It teaches concentration and observation. It teaches accuracy. Children rapidly learn to find the punctuation signs, to know them by name, and to use them. Later on, when the child has learned to write with more facility, he may copy thoughts in verse and prose from the great masters, and thus he gets a mental picture which will never be forgotten. In the same way, and without studying in the regulation manner from a spelling book, he will learn to spell. He will probably enjoy drill of all sorts on the machine. And if he makes a mistake in English and his mother or teacher calls his attention to it, the task of writing the correct sentence ten times on the machine will fix it in his memory so that he cannot forget it.

After a child has learned to know the printed letters he can be taught the script letters very easily. Set him to copying the letters singly, just as he would copy a picture, until he has them fixed in his mind. When he begins consciously to learn to write he will find it much easier than will the child who has never become familiar with the picture of *a, b, c,* etc.

Hurry, worry and fear should be driven from the schoolroom, and, in fact, from all paths leading to knowledge. Children should be given fewer tasks, and that relic of inquisitional torture, the examination, should be absolutely banished. Who knows how many nervous wrecks it has been responsible for? If children learn to study for the sheer love of gaining knowledge and not for the sake of winning deportment cards and bits of sheepskin, examinations will have no further usefulness. Let a teacher only arouse a child's thirst for knowledge, show him how to travel to the "knowledge fount," and he may safely be left to his journey. No prodding will be necessary.

As we study Nature and people, education seems to narrow down to two real objects—self-control and the joy of service. Tiny babies can be taught to control themselves. Alexander the Great conquered worlds—and died without having learned self-control. No wise mother had trained him from the first for the conquest of himself. All children get their first lessons by imitation. How then can they learn to master themselves if those about them lack poise and perfect control? See to it that your children have before them a splendid example to imitate.

Tiny children soon learn the joy of service. They scarcely need to be taught, rather they only need to be encouraged, to do little acts which will bring pleasure to those around them; and by giving joy they make gladness for themselves. Let us all learn that one of the joys of achievement is the realization that we can do more for others; and let children learn to do a variety of things. To master one thing is essential, but, in addition, let them be "jacks of all trades." Thus and only thus can an all-around development be secured.

All languages should be taught to children in that same memory period, between the ages of two and twelve, and through the natural or direct route—that is, through the ear rather than the eye. Children under twelve years learn to speak foreign languages very quickly, whereas, if they wait until the high-school age before they make the attempt, and in addition try to learn languages through the grammar route, interest vanishes and the work brings weariness and unhappiness into the student's life. Children should get their first impressions of music in the same way—through the ear. It is absurd to imagine that the music reaches the soul through the eye, yet this is what many a music teacher seems to believe.

Mathematics, the *bete noir* of many children's lives, can also be made a joy, by treating it as the science of quantity, not in separate divisions of arithmetic (through many problems), algebra (more problems), and geometry, a stern, brain-nagging study. Children should be given some idea of all branches of mathematics from the beginning. Teach them to observe the geometrical figures that adorn many public buildings; let them become familiar with various geometrical forms by playing hexagon tag, pentagon tag, and similar games. Point out the fact that their hop scotch pen is made up of rectangles. Tell them that their balls are spheres and their blocks cubes. Do not make them work out problems in arithmetic. Give them a typical problem, and after they have mastered the principle let them make their other problems for themselves.

Develop their imaginations, that gift of the gods, by giving them all sorts of imaginative play. Let them tell stories and act them out. Let them make plays out of the stories of history or invent their own plays to fit the music and poetry and dancing that they love.

Let every game have some definite purpose. In fact, see that everything the child does is for a purpose. When he writes a letter let him send it to a friend. If he writes a story, preserve it for him in a note book. Make him keep a general information book and show him how to seek out information in the dictionary and other books of reference, and put it down.

As to discipline, there is no need of it in a home where Natural Education ideas are followed out. Mischievousness is only misdirected or undirected energy. The child who is kept busy to a purpose is always happy, and happy people are never bad.

The following principles are given to express briefly and concisely the aims of Natural Education:

Education from the cradle to the grave.

Training for parenthood.

Development of the child's mental-physical-spiritual trinity in the cradle.

Development of every normal child's talent by the parent.

Children taught how to play to a purpose.

Development of the five senses to serve as body protectors.

Children encouraged to use Nature's information seeker—the question.

Parents encouraged to answer children's questions.

Developing the imaginative or creative faculty above everything.

Using Mother Nature as the first teacher.

Encouraging expression instead of repression.

Encouraging children to teach what they have been taught.

Training each child as an individual and not in a class.

Giving children constructive instead of destructive toys and teaching them to admire the giver of life rather than the taker.

Filling the child's mind with beautiful thoughts in the memory period (five to twelve) so that when the age of reason begins at twelve years he will have something worth while upon which to reason.

Teaching all languages by the natural method before the twelfth year.

Teaching music through training of the ear before the eye.

Teaching important facts through jingles.

Giving practical knowledge to make efficient citizens.

Doing away with examinations through using interesting children's books.

Giving teachers higher salaries, shorter hours and fewer pupils.

Encouraging the nurturing instinct in the young through making gardens and taking care of younger children.

Using Esperanto to teach the roots of modern languages and to provide each child with an international medium of communication.

Teaching how to read, spell, punctuate, speak good English and memorize by using the typewriter.

Keeping the fairies, Love, Sympathy, Good Cheer, in the home and school.

Banishing the demons Hurry, Worry, Fear.

Obliterating "I Can't" from vocabularies and using "I'll Try."

Having high ideals.

Laying the five foundation stones of education, Observation, Intense Interest, Concentration, Imitation, Exploration, and seeking to become educated in the highest sense through learning.

Self-control and the joy of service. W.S.S.

Measuring Results of Education

For a long time education was a matter of individual concern. The parent selected a teacher or an educational institution as a matter of individual choice. He had in mind certain things which he wished his child to accomplish. He sought for a school which was calculated to give to his child just the accomplishments which he wanted. He employed the teacher or the institution to render this special service. If he was dissatisfied for any reason, the service was discontinued. Parents who did not care for their children to be "educated" were not especially concerned with the teacher or the institution, since they were neither patrons nor supporters. Consequently, it was necessary for the teacher or the school to satisfy only the pupil or the parent. The relationship was personal and intimate. The work was being evaluated every day by the teacher, the child and the parent.

With this simple voluntary arrangement there was little question about elaborate systems of measurement of result. The worth of the school or the teacher was measured on the basis of certain personal qualities. The common questions were, Do you "like" the teacher? Do you "like" the school? Is your teacher "kind"? These questions were all more or less subjective. The answers rested upon a somewhat intimate relationship; in case they were unsatisfactory the remedy was simple.

With the development of the tax-supported school system and compulsory education legislation, came new problems. Billions of dollars are being expended now for the purpose of safeguarding oncoming generations. The parent no longer has the option of deciding whether his child shall go to school. He no longer has the option of selecting his child's teacher, or even a particular school.

The New Relation Between Teachers and Parents. Society as a whole, through its delegated authority, selects the teacher, selects the text-books, and determines the standards of the school. The relationship between the modern school and the individual parent has become more or less impersonal. Indeed, the whole movement of parent-teachers associations of the present day is an expression of a desire to restore this warm personal relationship between the parent and the teacher (see PARENT-TEACHER ASSOCIATION). In the United States alone there are to-day nearly 700,000 teachers. It is estimated that there are more than 100,000 vacancies each year, which means that there are more than 100,000 teachers who are new to their particular tasks. There are also many thousands of teachers who propose to stop teaching at the end of each year. Among the other half-million teachers, many have taught only one or two years. With all these variations in experience and mental attitude on the part of the teachers, it is small wonder that there is great difficulty in determining proper standards of preparation of the children throughout the grades.

The Need for Standards of Achievement. Among the many questions of standards which arise are those in regard to the mental expectancy for children on entering a particular grade. How much more should we expect after a child has been in school one year, or two years, or five years? How well do the children add, read or write? How much history should they know? These questions demand a more adequate system of measurement than the personal opinion of teachers with a limited amount of experience and training. It is not enough to say that the child is "poor" in reading, or "good" in adding, or "excellent" in penmanship, unless we know something of the standard of excellence in the mind of the teacher. It is not enough to ask whether or not the child is "good," or "well-behaved," or that his parents are "reasonable," or whether the child "likes" the teacher. It is not enough to report that the children "study" or that they are "industrious." Now that society requires that a parent place his child under a particular teacher, in a particular school, it is only right that he should know whether or not teacher and school are efficient.

As these questions have become more and more insistent, the schools have come more and more to demand means of measuring educational attainment; means of measuring educational progress; means of measuring teaching efficiency. In answering these questions students of the science of education have been influenced by the great development of measurements in other types of activity, as agriculture, medicine or business.

With the introduction of cost accounting systems on farms, in stores and in factories, it is to be expected that the public will demand a more definite system of school accounting, a more adequate system of measurement of educational results. As a matter of fact, the demand for such measurements has been parallel to the demand for measurement in all other fields.

Methods of Grouping Pupils. The attempts to grade children in the schools which have been made in recent years express the school administrator's desire to measure the educational progress of children. Among the various attempts at grouping children might be mentioned the scheme of grouping children on the basis of age, size, years in school and mental maturity. Certain attempts have been made at grouping children of the same age together, others of the same size, others of the same number of years in school, others of the same mental maturity. The seating arrangements in the old-fashioned school furnished evidence of the fact that children were not infrequently sorted on the basis of size. The scheme of grouping children in seven, eight or nine grades on the basis of the number of years they have been in school is a later attempt at a satisfactory grouping. The present ideal is to group children so as to have them of as nearly the same degree of mental maturity as possible, irrespective of the number of years in school, or of size or age.

Educators realize that children of the same size are not necessarily of the same degree of mental maturity. Neither are children who have been in school the same number of years of the same degree of mental maturity. Indeed, the investigations which have been made in recent years show marked variability in this particular. The records in some cities show that as many as seventy-five per cent of the children have been unable to do the required work in the allotted time. Modern educators have provided adjustable seats so as to make it possible to provide a flexible system of seating. They have likewise attempted to work out new schemes of promotion, such as the semi-annual promotion, in order to provide an adaptable system of caring for the

children of different degrees of educational progress.

Many of the earlier and more crude standards of measuring the educational progress of children still prevail. One of the best examples is the use of text-books which are theoretically graded so as to mark the progress of the children. The use of the text-books in reading is a case in point. Here the editors designate the gradation by a series of titles such as First Readers, Second Readers, Third Readers, and so on. Unfortunately editors of reading text-books have rarely known enough about the progress of the children to be able to issue the final verdict in connection with reading ability.

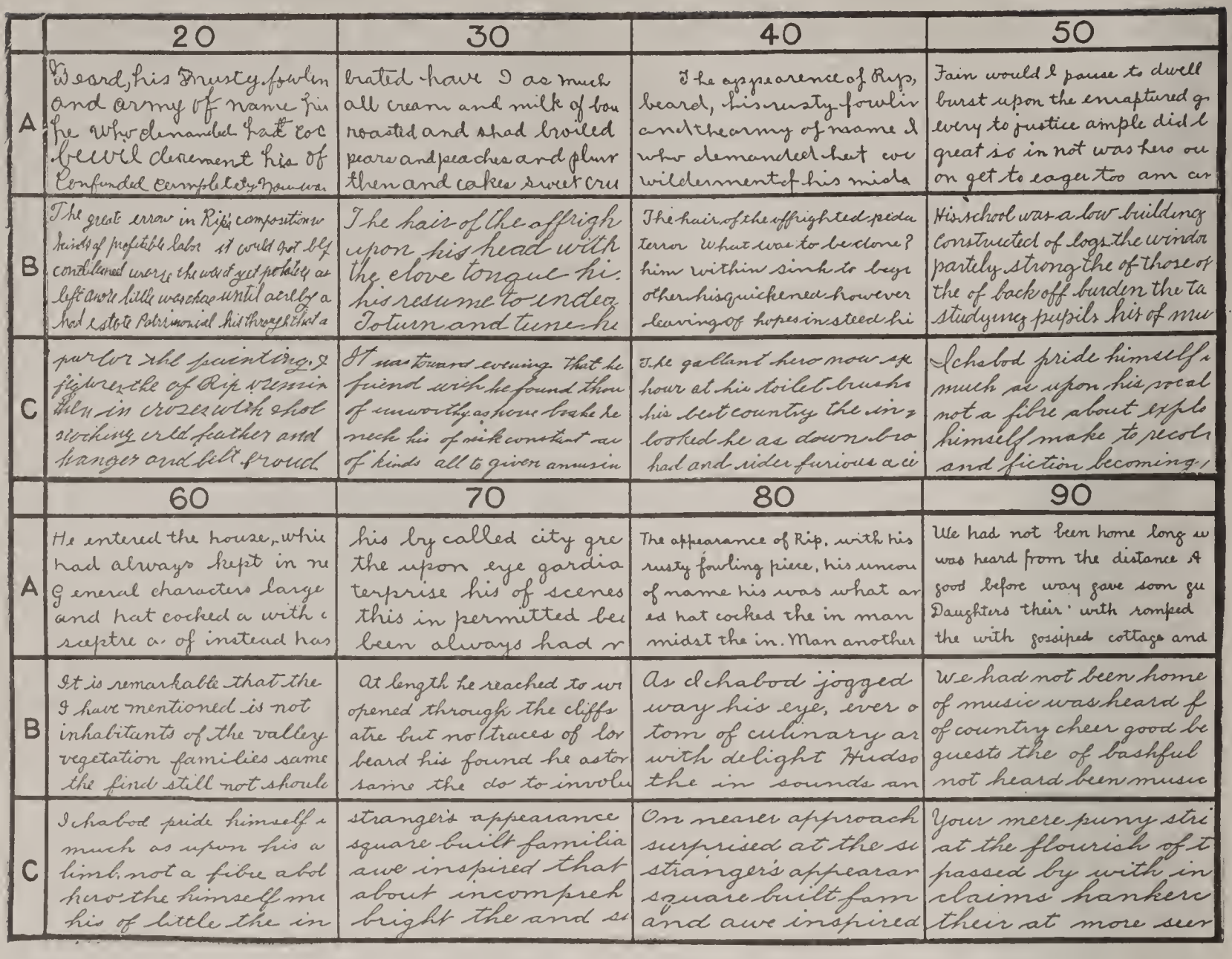
Variations in Standards of Promotion. The theory of promotion from one grade to the next has been that the work of one grade would prepare a child to do the work of the next. One of the difficult problems in connection with this system has been the inability of the teacher to know what to expect of a child in a particular grade. The teacher in a particular grade has often been ignorant as to how much or what to expect of the children in her own grade. She has also frequently been ignorant of what the teacher would expect of her children in the grade following. Some teachers in their desire to be thorough and to escape criticism from the teachers in the grade beyond set an unreasonably high standard, refusing to promote any but those able to meet this unreasonable standard. Others set up too low a standard of promotion, so that when the children are promoted they are unable to do the work required of them. These variations in standards for promotion have become so obvious as to be the cause of no little concern in the minds of teachers and school administrators.

The attempts to measure the progress of children throughout the grades made by Thorndike, Ayres, Blan, Strayer and others not only have served to call the attention of the general public to the necessity for a more adequate system of measurement of what to expect of the children from grade to grade and from subject to subject, but they have helped to meet the situation suggested above.

Dr. Blan found that wide variation existed in different sections in regard to the number of children who failed of promotion in certain grades. For example, 30.8 per cent of the eighth-grade pupils of one city had failed of promotion in the first grade; whereas, in another only 1.2 per cent of the children in the eighth grade had failed in the first grade. This indicated that in the first city a different standard of attainment was held for the children in the first grade, or the children of the first grade were of an inferior type. It is not likely that the latter is as satisfactory an explanation as the former. In all probability it is due to the fact that there are different degrees of ability in the measurement of the work in the first grade in the two cities, as well as differences in standards of attainment to be expected of first-grade children in the two cities. Dr. Blan found in general that "the pupils find the lower much easier than the upper grades." This difficulty of properly grading the work of the different grades is partially due to the fact that the schools have not adequately done the work to be accomplished in the different grades.

Why Educational Measurement Is Necessary. The demand for adequate educational measurement has come about through the desire to throw light on these and similar questions. The superintendent has found it necessary to ask the fourth-grade teacher, for example, what she expected of her children in spelling, penmanship, arithmetic and reading. He has asked her whether or not the standard of attainment in her grade has been as high as in a similar grade in New York, in Boston, Detroit, or in neighboring cities. The answers to these questions are highly desirable in view of the fact that the work of the schools is being constantly evaluated by the public. Children leave one school to go to another, or go out into the world. There should be a clear understanding of the expectation of performance on the part of a child in the various fundamental subjects. By means of educational measurement it should be possible for us to determine whether or not a child in a particular grade is able to read, to write or to cipher as well as we have a right to expect him to do.

Measurement of Handwriting. One of the earliest attempts at the measurement of handwriting was made by Professor Thorndike, of Columbia University. He secured thousands of samples of handwriting, which he afterwards had rated on general merit by a large number of competent judges. Each judge was asked to distribute the samples into a series of groups, based on the least noticeable differences, the best papers in one pile, the next best in another pile, and so on. Building on the composite judgment of a large number of these judges, Professor Thorndike constructed his handwrit-



	20	30	40	50
A	Weard, his Rusty fowlin and army of name Jin Ipe Who demanded Irak coc bellil clenement his of Confunded Cerrfbl by Jour wa	brated have I as much all cream and milk of bou roasted and shad broiled pears and peaches and plur then and cakes sweet cru	The appearence of Rips, beard, his rusty fowlin and the army of name I who demanded that coc wilderment of his mista	Fain would I pause to dwell burst upon the enraptured g lvery to justice ample did l great is so in not was hers ou on get to eager too am ar
B	The great error in Rip's composition kinds of profitable labor it would not by considered unery the world yet probably as left anore little was chae until acelby a had estate Patrimonial his through that a	The hair of the affrigh upon his head with thy clove tongue hi his resume to indeg To turn and turne he	The hair of the affrighted peda terror What was to be done? him within sink to begs other his quickened however leaving of hopes in steed hi	His school was a low building constructed of logs the windo partely strong the of those of the of back off burden the ta studyeng pupils his of mu
C	parlor the spainting of figures the of Rip Vessin this is crosses with shot stocking cold feather and hanger and bell proud	It was toward evening that he friend with he found thou of unworthy as home brake he neck his of nik constant as of kinds all to given amusin	The gallant hero now sp hour at his toilet brushe his best country the in looked he as down bro had and rider furious a ci	Ichabod pride himself much as upon his social not a fibre about explo himself make to recol and fiction becoming
	60	70	80	90
A	He entered the house, whic had always kept in ne General characters large and hat cocked a with c sceptre a of instead has	his by called city gre the upon eye gardia terprise his of scenes this in permitted bee been always had r	The appearance of Rip, with his rusty fowling piece, his uncou of name his was what ar es hat cocked the in man midst the in. Man another	We had not been home long w was heard from the distance A good before way gave soon gu Daughters their with romped the with gossiped cottage and
B	It is remarkable that the I have mentioned is not inhabitants of the valley vegetation families same the find still not shoule	At length he reached to wi opened through the cliffs atre but no traces of lor beard his found he astor same the do to involu	As Ichabod jogged way his eye, ever o tom of culinary ar with delight Hudso the in sounds an	We had not been home of music was heard f of country cheer good be guests the of bashful not heard been music
C	Ichabod pride himself a much as upon his a himb not a fibre abol hero the himself me his of little the in	stranger's appearance square built familia awe inspired that about incompreh bright the and su	On nearer approach surprised at the su stranger's appearar square built fam and awe inspired	Your mere puny stri at the flourish of t passed by with in claims hankere their at more seer

MEASURING SCALE FOR HANDWRITING

To measure the quality of a sample of handwriting, slide it along the scale until a writing of corresponding quality is found. The number in black represents the value of the writing being measured.

(Chart provided by Leonard P. Ayres, Russell Sage Foundation, New York City.)

ing scale, which consists of a series of samples of handwriting ranged in merit from quality eighteen, which is artificially perfect copper plate, to quality one, which represents zero in handwriting merit.

The Ayres scale, though not the first handwriting scale made, is in general use throughout the country. Dr. Leonard P. Ayres developed this scale on the basis of legibility. By means of an accurate system of time checks, he determined the length of time necessary in order to read certain specimens of handwriting. Specimens were then selected so as to form a graded series of increasing legibility.

The teacher who wishes to measure the writing in her room by the Ayres scale may compare the samples of handwriting of each of her pupils with each quality on the scale. For example, let us suppose that a teacher of the sixth grade has thirty children. After comparing the handwriting of each of these pupils with each sample on the accompanying scale, she finds that she has one pupil whose writing is most like quality twenty; five that are most like quality thirty; seven that are most like quality forty; ten that are most like quality fifty, and so on. She is now interested in knowing how this handwriting compares with the handwriting of other children in the same grade in the United States. Many teachers measure the handwriting of each child at the beginning and the end of the term; thus they are able to tell the exact progress that each child has made in the meantime. Many high school principals establish the standard of handwriting required in the school, with the understanding that written work handed in by the children will be measured by use of the scale. The children who fall below the standard take special instruction in handwriting.

Millions of samples of handwriting have been measured by means of these scales, so that it is possible for any teacher to evaluate the work her children are doing in penmanship, both as to quality and as to speed, as compared with the work of other children, elsewhere. By this means it is possible for the efficiency of penmanship instruction to be determined.

Dr. Frank N. Freeman of the University of Chicago, after an exhaustive analysis of public school writing, proposed the following standard of quality and speed, as measured by the Ayres scale:

Freeman's Standard

Grade	II	III	IV	V	VI	VII	VIII
Quality	44	47	50	55	59	64	70
Speed	36	48	56	65	72	80	90

This table means that the average child in the second grade should write a quality 44 on the Ayres scale at the rate of 36 letters per minute; a quality 47 at a speed of 48 letters per minute, in the third grade; a quality 50 at a speed of 56, in the fourth grade, and so on.

Dr. Starch of the University of Wisconsin proposed the following standard, based on over four thousand samples:

Starch's Standard

Grade	II	III	IV	V	VI	VII	VIII
Quality	27	33	37	43	47	53	57
Speed	31	38	47	57	65	75	83

This table means that the average child in the second grade ought to write a quality of 27 at a speed of 31 letters per minute. The average child in the third grade ought to write a quality of 33 at a speed of 38 letters per minute.

Ashbaugh and Newcomb made an analysis of 28,000 papers from 110 cities, towns and rural schools in Iowa and found the following standard:

Iowa Standard

Grade	II	III	IV	V	VI	VII	VIII
Quality	35.7	39.8	44.5	49.1	52.3	57.	61.
Speed	39.2	49.6	61.9	65.5	72.6	75.	76.5

This table means that in Iowa the average second-grade child wrote quality 35.7 at a speed of 39.2; the average third grade child wrote quality 39.8 at a speed of 49.6, and so on.

By utilizing such data it is possible for a teacher to measure the progress of her own instruction and compare it with instruction elsewhere.

Measurement of Composition and Arithmetic. In a similar way composition scales have been worked out by Dr. Milo B. Hilligas of Columbia University and by Dr. Frank Ballou of Harvard University. Many teachers have found the use of these helpful.

The result of instruction in arithmetic has been subjected to measurement for many years. Among the names most prominent in connection with the measurement of arithmetical results are Rice, Stone and Courtis. In 1902 Mr. Rice gave the same test under similar circumstances to more than 6,000 children in seven cities. He found a very wide range in the ability of children to respond to the same test. A few years later Dr. Stone gave an examination to pupils in the 6A grade in arithmetic in twenty-six cities; he also found a wide variation in arithmetical ability.

However, the most thoroughgoing attempt at measuring arithmetical ability has been made by Mr. S. A. Courtis. Mr. Courtis developed a series of tests so arranged as to stimulate each child to do his utmost in a given time.

The teacher who gives these tests fixes the time limit in accordance with the directions of the test; for example, eight minutes is the limit for addition. At the time of the test each child is supplied with a booklet on which are blank spaces, calling for his name, age, grade, etc. On the body of the page is printed a series of problems, like the examples below:

Add:		
	982	356
	347	235
	236	872
	328	543
	456	271
	723	890
	897	397
	416	428
	648	756

The page is filled with this type of problems and at a given signal each child begins to add. At the close of eight minutes, time is called, the material is then graded on the basis of the number of problems attempted, and on the number of problems successfully solved. Similar tests are provided in subtraction, multiplication and division. Hundreds of thousands of these tests have been given to children in the fourth, fifth, sixth, seventh and eighth grades, in large cities and in small cities. Indeed, it is now possible for a teacher in any grade from the fourth to the eighth to determine whether or not her children are able to add, multiply and divide as well as are children in the same grade elsewhere.

Standard Scores

Grade	Test 1 Addition	Test 2 Subtraction	Test 3 Multiplication	Test 4 Division
III	3	4	3	2
IV.....	5	6	5	4
V.....	7	8	7	6
VI.....	9	10	9	8
VII....	11	11	10	10
VIII...	12	12	11	11

Standard accuracy=100 per cent.

Measurement of Reading and Spelling. Tests for measuring reading are being rapidly developed. Among the names most prominent in connection with the reading tests are Gray, Kelley, Jones, Courtis and Thorndike.

Spelling tests are likewise being standardized. Among the names in this connection are Ayres, Buckingham and Courtis. In measuring high school subjects, the names of Starch, Ballou, Monroe and Breslich stand out prominently.

Measurements a Check on Methods. Educational measurements are being used not only to check the gross efficiency of the teachers, but they are coming to be used more and more as a means of checking the effectiveness of certain methods. For example, it is possible by means of modern educational tests to measure the comparative efficiency of text-books or of different pedagogical methods. One of the best-known examples of the latter is found in the investigation of Mr. J. C. Brown, who by means of the Stone test measured the value of the three-minute daily drill period in the teaching of arithmetic. Mr. Brown and Mr. Pierson of the Horace Mann School measured the value of two different methods of teaching spelling by means of a spelling test. The investigations of Rice, Stone and Courtis agree that a large time expenditure is not necessarily associated with a high type of product, regardless of method.

Thus it may be seen that with the development of the technique of educational measurement, it is becoming more and more possible for schools to develop a high type of efficiency. Great interest is being shown in educational surveys; this is expressed in legislative demands for state-wide surveys, such as have been made in Ohio; surveys of higher education, as found in Wisconsin, Iowa, Washington and Missouri; surveys of city school systems as found in New York, Portland, Cleveland, Baltimore and San Francisco. The surveys are evidences of the fact that the citizen is becoming interested in getting an adequate measurement of education. Educators everywhere are responding to this demand by developing an elaborate technique for accomplishing this end. W.A.J.

Modern Tendencies in Education

There are many definitions of education—almost as many as there are men and women who have written books about education. Most of these definitions, however, may be reduced to one or the other of two general forms: In the first place, education may be looked upon as the process of directing or controlling the *natural growth* of the child; in the second place, education may be thought of as giving to the child some of the *knowledge* and *skill* that the race has acquired in its long experience. Those who emphasize natural growth as the fundamental factor in education will care for children very much as the good gardener cares for plants; that is, they will aim to provide opportunities for healthful and natural growth; they will find in the process of education a large and important place for *freedom;* they will let education follow the child's *interests* and *desires,* just as far as these can be safely trusted; and they will look with disfavor upon the use of *force* or *compulsion* in stimulating "learning."

On the other hand, those who view the passing on of knowledge and skill as the fundamental educational aim will not be likely to trust the child's interests and desires so far; they will see to it that the knowledge and skill which the race has accumulated are well organized and made as palatable as it is possible to make them, but they will also insist that the child make an effort to learn, even if the lessons do not always appeal to him, and they will insist especially that the learning be undertaken systematically and progressively.

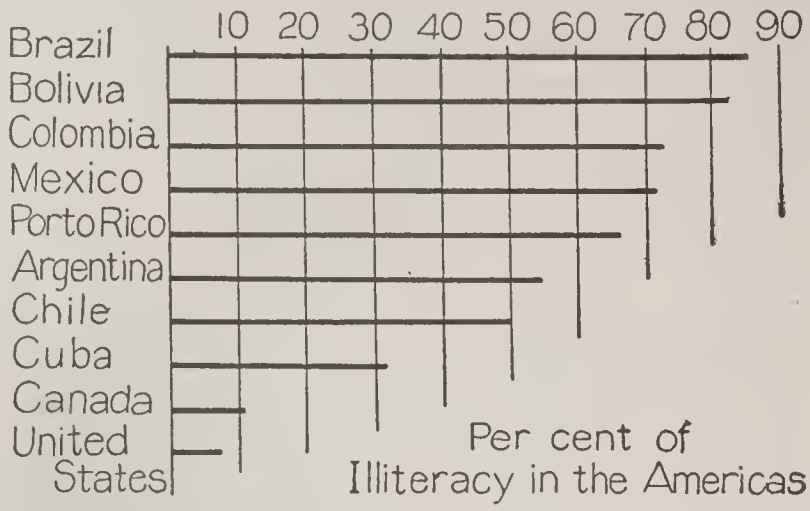
Education as Natural Growth. Modern education combines these two points of view, although the emphasis at the present time is rather more heavily upon "natural growth" than upon the systematic mastery of knowledge and skill. This is probably because knowledge and skill have been the important aims of the schools for centuries, while the claims of natural growth have been looked upon with favor only within a comparatively short time—although these claims have been recognized by students of education for centuries.

Probably the most important differences between modern education and the education of the past are to be found in the improved methods of teaching which have come with this recognition of the importance of natural growth. Modern education is not blind to the fact that children must master knowledge and acquire skill; in this respect, it accepts the older educational aim, but it does insist that this mastery shall make as much use as possible of the child's natural capacities for growth as

indicated by his interests and desires. Perhaps its most important principle is that all learning that is to be at all effective must be based upon the child's own experience, and that any attempt to force the child to master something for which he has no basis of understanding or interpretation in his own life is a waste of time and effort. Hence one of the important problems that modern education has attempted to solve is this problem of providing rich, concrete, individual experiences with actual situations and actual objects, as a basis for the systematic, "abstract" study.

The old-time school placed a book in the child's hands and forced him to memorize its contents with little reference to whether the words were really understood or not. Very frequently the words were not understood, and the "learning" became nothing but a parrotlike repetition of meaningless symbols. One finds in our schools of to-day occasional instances of this barren and fruitless attempt at "education," but the better schools condemn such practices, and good teachers make it their first business to see to it that children have a basis in actual experience for the knowledge they must acquire. Sometimes the objects that are being studied about are brought into the schoolroom; sometimes the children make excursions to the objects; the sand table and the molding board are used to reproduce in miniature actual situations; and when other forms of illustration are not available, pictures are liberally employed. The effort always is to give the child actual experiences, and, failing this, to stimulate his imagination to the point where he can gain an adequate notion of what the actual things are like, and of how he might act if he were face to face with them in an actual situation.

What Educational "Experience" Means. It is this insistence upon *real experience,* then, that most clearly distinguishes modern education from the education of the old-time school. And the word *experience* is coming to have a wider and a richer meaning as the modern teacher works with the problem. When the futility of having children memorize words that had little or no meaning to them was first recognized, some educators thought the difficulty could be overcome merely by having objects to illustrate the words. For example, if children were studying about spheres and pyramids, it was thought sufficient to have actual spheres and pyramids to be looked at and handled; if dogs were to be studied, a real dog could be brought in; if the child was to understand what a "bushel" meant, he should look at and perhaps handle a bushel measure. This, indeed, was a marked advance over the parrotlike repetition of words, but after all it did not solve the problem of giving the pupil



Brazil, all ages, unable to write.
Canada, over 5, unable to write.
Colombia, males, all ages, unable to read.
Mexico, over 12, unable to write.
Porto Rico, over 10, unable to write.
Chile, over 10, unable to read.
Cuba, over 10, unable to read.
Bolivia, over 7, unable to write.
United States, over 10, unable to write.

"real" experiences." Gradually, as teachers struggled with the task, an essential truth emerged: if an object is really to *mean* anything to the child it must have some connection with a vital "problem" which he has a strong desire to solve.

One may learn something about pyramids and spheres by looking at nicely-fashioned wooden models of these objects; one may learn something about dogs by looking at real dogs; and one may learn something about a bushel by looking at an empty bushel-measure. But one learns much more about these things if they have a definite relation to a life-problem. What dogs can eat, what must be done for them in the way of shelter and training, what precautions are to be taken if they are not to be carried away by the dog-catcher and incarcerated in the "pound"—these matters become of large significance and "meaning" if the child owns a dog of which he is very fond, and the protection and care of which may be made to appeal to him as a "real problem."

It is, of course, very difficult for the teacher or the parent to relate all of the knowledge and skill that the child must master to some real problem that is significant to the child's own life. Modern education has not thus far decreed that all knowledge must be passed on in this way. It has, however, set a high sanction upon teaching through "problems," and it has strongly insisted that the early basis of all

learning shall be laid in this way. After the beginning has been made, the normal child will be able to undertake the systematic and progressive mastery of recorded knowledge with a fair hope of success; but modern education believes that, even in the later stages, when knowledge can be assimilated in a somewhat "abstract" form, the use of this knowledge—its application to the solution of human problems—should always be an important phase of the teaching.

Emphasis upon the Social Phase of School Life. Another striking difference between modern education and the education of the past lies in the emphasis that is now being given to the *social,* or *group,* phases of school life. It was not so very long ago that practically all of the teaching in the lower schools was individual teaching; that is, although children were brought together and placed under the instruction of a teacher, the children did not participate as a group in the school exercises. On the contrary, the teacher called the pupils to him, one at a time, "heard" their lessons, and sent them back to their benches for independent work. The method of class instruction (or the "simultaneous" instruction of a group of pupils) was an important forward step, although, like many other forward steps, it had certain disadvantages. It is difficult, for example, to make class instruction meet the needs and the capacities of every member of a group. Some pupils are naturally "bright," others are naturally "slow"; class instruction tends to reduce them all to the same rate of progress, and this is likely to work an injustice both to the brighter pupils, who might proceed very much more rapidly, and to the slower children, who find themselves handicapped even by attempting a rate of progress which the average pupils can readily attain.

Several methods have been devised to overcome these difficulties of group-instruction: one plan employs two teachers for each classroom, and gives one teacher charge of the group-work, while the second teacher "coaches" the individuals who fall behind, or gives added instruction to the brighter pupils who can make more rapid progress; another plan segregates pupils into groups, according to their ability, and permits each group to progress at a favorable rate; still another plan practically returns to the older method of individual instruction, abandoning class organization and permitting each pupil to advance as rapidly as he may.

On the whole, however, group-instruction, in spite of its disadvantages, has brought into school work a very important socializing influence. Children work together, learning from one another, competing with one another, sharpening one another's wits. And the more recent developments have been in the direction of still further organizing and utilizing these important social forces. It is the aim of modern education to make not only the school *studies* but also the school *life* of the pupils an important educative force. The school is to be looked upon as a miniature community, and the problems of this community are to be regarded as matters of deep concern to the pupils themselves. It is believed that by utilizing these opportunities a great deal may be done to cultivate in the pupils certain qualities which will make for social coöperation and which will do much to prepare them for the duties and responsibilities as well as for the privileges of citizenship.

Health and Physical Development. A third characteristic of modern education is its emphasis upon *health* and *physical* development. In the more progressive school systems, physicians, dentists and nurses are regularly employed to look after the health of the children. Careful physical examinations are made at stated intervals. Especial care is taken to detect and remedy physical defects that have been found frequently to be at the basis of mental backwardness—adenoids, enlarged tonsils, decaying teeth and defective hearing and eyesight. Some systems of schools also employ clinical psychologists who look after the health of the mind very much as the physicians, nurses and dentists look after the health of the body.

The modern school plant also includes abundant facilities for physical training and games. Ample playgrounds are especially important, and the expert supervision of the plays and games of children is now thought to be as essential as the provision of space and apparatus for play. The modern school plant also includes gymnasiums, swimming pools and shower-baths. Still another indication of the increased emphasis upon health is to be seen in the provision for school lunchrooms and "cafeterias."

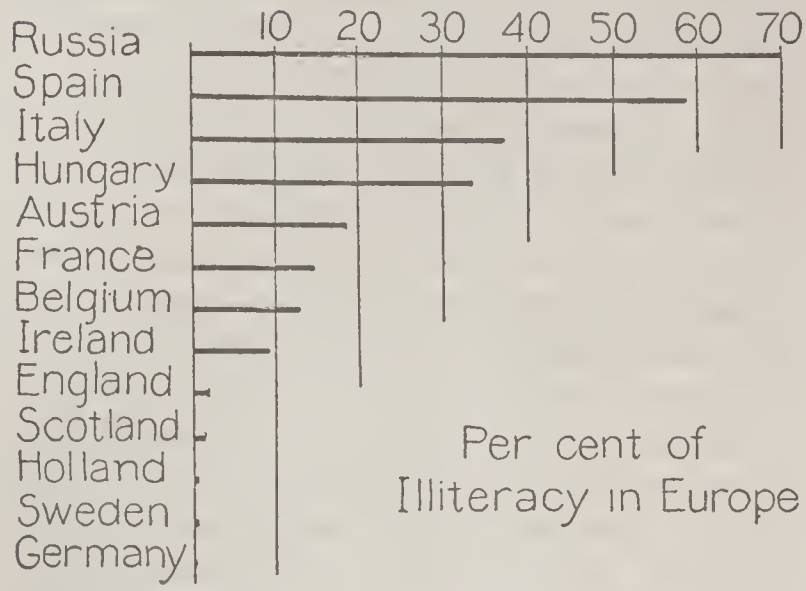
The Fundamental Arts. All of these and many more changes and improvements in the organization of education do not mean, however, that the modern school has neglected the work which the old-time school emphasized. The fundamental "arts" that made up the

curriculum of the elementary school a century ago—reading, writing and arithmetic—are no less important to-day than they have been in the past. It is probable, indeed, that they were never so important as they are to-day, and it is also probable that these basic subjects are being far more effectively taught in the modern school than they were in the schools of the past.

In so far as *school* education is concerned, indeed, these subjects will doubtless always have a fundamental place. And the reason is simple enough; when people live and work in close coöperation as they do under modern conditions, and as they must continue to do in increasing measure as civilization progresses, the arts of *communication* (the language arts) and the arts of *computation* (the simpler forms of which we call arithmetic) become of prime importance. Children readily learn to speak without the kind of training that the school provides; but few children can acquire a mastery of reading, writing and the essentials of arithmetic without careful instruction and training. Facility in these arts must be given, not merely to *some* children, but to *all* children; otherwise those who remained "unlettered" would be at a great disadvantage in life, so important are these arts under our complex social conditions.

Compulsory Education. During the past century, the principal countries of the world have made this basic or fundamental schooling compulsory upon all children between certain ages. Thus education is said to be "universal" in these countries, although it should be remembered that it is only this very elementary education in reading, writing and arithmetic (and usually in geography and the history of one's own country) that is really "universal." Notwithstanding this limitation, however, what this has come to mean to the lives of millions of people constitutes one of the great triumphs of modern civilization. "Universal" education, even in this limited sense, was practically unknown at the beginning of the nineteenth century. At that time, schooling of any sort was, generally speaking, the privilege of only a small proportion of the total population.

And there are, of course, many nations to-day that have done very little for the education of "all the children of all the people." How far a nation has carried the ideal of "universal education" is roughly measured by the per cent of illiterate adults in its total population. This per cent is lowest in the countries of Northern Europe (particularly in Germany, Holland, Switzerland and the Scandinavian countries); in the British Isles (and particularly in England and Scotland); in the Northern, Central, and Far-Western states of the American Union; in certain of the British possessions



These statistics are significant only in a general way, because of the different ways in which they are compiled. For Russia, Spain and France they represent the population over ten years of age unable to write; for Italy, those over ten unable to read; for Hungary, those over six unable to read and write; for Austria, those over eleven unable to write; for Belgium, those over ten unable to read or write; for Ireland, those over nine unable to read; for England and Scotland, marrying persons unable to write; for Sweden, army recruits unable to write, and for Germany recruits without schooling; Holland, recruits unable either to read or write.

(and particularly in Canada and New Zealand, but not in India); and in Japan. Another rough measure of the care which a nation exercises in matters educational is the per cent of its total population that is enrolled in its elementary schools, that is, in what corresponds to the first six, seven or eight years of our "common" schools. In a country where education is fairly general, the elementary schools at any one time will enroll between fourteen and twenty per cent of the total population. Thus England and Germany have each about seventeen per cent of the total population in these schools; the United States, about eighteen per cent; Canada, about fourteen per cent; Italy, only about nine per cent; Mexico (prior to the year 1913), about five per cent; Russia, less than three per cent.

Elementary and Secondary Education. "Elementary" education in the United States and Canada is usually thought of as covering the first eight years of the child's school life (the first eight "grades" of the common school). In general, elementary education in the two countries named comprises the particular kinds of knowledge and skill a mastery of which is believed to be essential to *all*. There is at the

present time a marked tendency to reduce the elementary school to a six-year basis, and to reorganize the seventh and eighth grades with the first year of the high school (the ninth grade) into what is called an "intermediate school," or a "junior high school." The chief advantage of this new organization is that it will permit a differentiation of school work at the beginning of the seventh year instead of at the beginning of the ninth year; the disadvantage lies in the fact that the earlier the school work is differentiated into distinct "curriculums" the less will be the total amount of work that all will have in common, and the more difficult will be the problem of making wise choices.

"Secondary education" is represented typically by the four high-school years. If the present plans for reorganization are generally accepted, however, secondary education will begin with the seventh grade. This type of education aims to meet somewhat specialized needs, and consequently attempts to provide more than one curriculum, or group, of studies. Thus in the larger high schools to-day one may find a rich variety of "curriculums." One curriculum may be made up largely of Latin, Greek, algebra, geometry, physics and other studies that have in the past been recognized as "preparing for college." Another curriculum may omit the classical languages, and provide instead a more extended training in English and in the modern foreign languages (especially German, French and Spanish).

Still another curriculum may aim to prepare boys and girls for business life, and will consequently emphasize such subjects as bookkeeping, stenography, typewriting, commercial law, commercial arithmetic and commercial geography. Another may be strongly "technical" in its purpose, and include not only "manual training" of the older type, but also thoroughgoing courses in draughting, machine-shop practice, foundry work and the like. Still another will have as its core the subjects that are related to the household arts—such subjects, for example, as chemistry, sanitation, textiles, home decoration, cooking and sewing. The essence of secondary education as it has developed in this country, then, is this provision of "differentiated curriculums" to meet different needs, tastes and occupational interests. The high school is no longer thought of as merely a school preparatory to college—a "fitting" school—but rather as a school preparing for a variety of life activities—a "finishing" school; but it should be added that preparing boys and girls for college is still an important task of the high school.

Higher Education. "Higher education" includes the work represented by the colleges and universities, or the years of school life from the eighteenth on. Like secondary education, it, too, is "differentiated" into separate curriculums, among which the old-time college course, with its rigid requirements of Latin, Greek and mathematics, is now scarcely recognizable.

Education of All the Children of All the People. But when we speak of "elementary," "secondary," and "higher" education as referring to conditions in the United States and Canada, we must remember that our educational situation is in many ways quite different from that which prevails in almost every other part of the civilized world. For example, in Germany, as in most of the European countries, there are different schools for different social classes, and the children of the "upper" and "middle" classes do not generally attend the same schools as do the children of the "masses." What in Germany corresponds to our elementary school (or the first eight grades) is called the "people's school," and is really a school for the masses. A boy or girl who passes through these eight years of schooling in Germany is not in a position to go on to anything corresponding to our high school and college. Indeed, boys and girls who are to go to college must be placed in a "secondary" school at about the age of nine (that is, at a point corresponding to our fourth grade). The result of this policy of separate schools is that secondary education and higher education are class privileges, practically limited to the children of wealthier parents who can afford to pay the tuition fees of the secondary school, and who can look forward to a higher education for their children.

What the United States and Canada have done in the organization of their schools, then, has been essentially to preserve the "open door" of opportunity for all. These schools are organized on a "unit" basis; someone indeed has characterized such a school system as an "educational ladder" with its "base in the gutter and its tip in the university." If at any point on this "ladder" the boy or the girl decides that he or she will have a higher education, the way is open; the steps will not have to be retraced as they must be in almost every other country if such a decision is reached after the

age of nine, ten or eleven years. This system also keeps the children of all classes together during the greater part of their elementary and secondary schooling; during the first eight years (or at least during the first six years, if the present proposals are generally accepted), these children are studying practically the same subjects, and to this extent the next generation will have a "common culture"; during the high school years some of the subjects are usually common to all of the pupils, and in any case the children are together in the same school and live the same school life. But in most of the European countries the children of the more favored classes are segregated from the children of the masses; their studies are different; there is no intermingling in a common school life; and there is little opportunity to make the school curriculums represent a basic common culture.

Whether or not the system these countries have developed really makes for democracy, it is certainly true that we keep together in our schools a larger proportion of boys and girls from all classes than does any other large country. There are to-day in the public high schools of the United States and Canada almost as many boys and girls as are enrolled in all schools of similar grade *in all other countries combined.*

Defects in Our Schools. But in certain respects, the schools of the two countries mentioned are not so efficient as are the schools of certain other countries. We do not provide the opportunities that Germany provides for specialized training for bread-winning occupations. Indeed, countries like Denmark, Norway and Switzerland probably lead us in what is called *vocational* education. There is a reason for this; in the European countries society is more clearly "stratified" than with us; one's social "station" is determined largely by birth, and there is little shifting from one level to another. In America, on the other hand, society is more "fluid," so to speak; there is much shifting from level to level; the child of the humblest citizen *may* reach the highest positions. Because of this democratic ideal, our school system has been slow to recognize the value of a narrowly-specified vocational training that would take the boy or the girl at a comparatively early age and train him or her toward a highly-specialized industrial efficiency. The slow development of vocational education, in other words, is due fundamentally to the fact that people do not like to think of anyone as "predestined" to a certain calling or occupation.

It is generally agreed, however, that present-day schools must in some way meet this need for *occupational training* which modern education in other countries has recognized and met. The present tendency is to establish vocational curriculums either in the high schools or in specialized vocational schools paralleling the high school. Students of education generally favor the former plan because it will not separate the children who go into trades from those who go into the professions, and it is believed that the longer the children of all classes can be kept together, the better it will be for democracy. The present judgment of educators is also strongly against attempting to "vocationalize" boys and girls prior to the end of the eighth school year.

Vocational and Continuation Education. Many attempts are being made to provide both general and vocational education for boys and girls who leave school and undertake bread-winning employment at the close of the compulsory-schooling period, which usually ends at the age of fourteen. In some cities, these boys and girls are provided for in "continuation schools," which take them from their employment for one or more half-days each week, and attempt to give them instruction that will help them in their work. In general, the problem of caring for these boys and girls who go no further than the compulsory-schooling laws require is recognized as one of the serious and perplexing problems of modern education. At the present time, the number of these boys and girls is probably three times as large as the number of those who go into the high school. These boys and girls go out into the industries between the ages of fourteen and sixteen—the period of life most seriously fraught with moral dangers. So heavy is the toll of wreckage from this large group who leave school early that these two years are sometimes called the "wasted years."

The situation is still further complicated by the fact that apprenticeship to reputable trades and professions cannot commonly be begun prior to the age of sixteen. The result is that most of the boys and girls who leave school prior to sixteen either go into "blind-alley" occupations that lead nowhere, or spend part of their time at "odd jobs" and the remainder in idleness and mischief. It is toward the solution of this problem that the present energies of education are being largely directed. W.C.B.

Hygiene of Education

By educational hygiene is meant those principles of health which apply to an individual during his period of education, and those which schools can promote through their various health agencies. The school period is one of growth and development, a period when moral and physical habits are formed, a *plastic* period when the young person is easily molded. Whether life is to be personally satisfactory and efficient, or unsatisfactory and inefficient, depends very largely on how these early years are spent.

Both physical and moral character tend to become fixed at a very youthful age. Changes after the age of early childhood are hard to bring about and require an amount of effort greater than that required in early life. Specialists in child study are realizing more and more that to a very large extent health, character and disposition are closely interdependent, and that early experiences count very much more than later ones. It is difficult to break down a good start in life, but it is more difficult to build up the results of an unfortunate beginning.

Educational hygiene deals with those simple but fundamental principles of health which affect daily living. It includes home environment, school environment, community environment, and personal health habits. It is a *formative* sort of hygiene and thus deals with the formation of right habits, rather than with the correction of wrong ones.

In order to form health habits intelligently one must have some understanding of the results of health neglect, must in some reasonable degree understand the meaning of health danger-signals, which are nearly always displayed, and finally must form habits of such a fixed nature that they become almost automatic, for the less we are obliged to think about health the better. Health is fundamental in life; health is the only real wealth; yet, as has been well said: "On every side, the world over, we are confronted by the fact that health, including normal physical development, longevity and good bodily resistance, is being only very inadequately achieved by millions of people."

Practically no one lives up to his highest possible degree of physical or intellectual efficiency or even approximates such a desirable result. Everywhere there is ruthless waste of vital energy. The length of human life is less, by at least half, than what it might be; happiness is only a relative term, because happiness is conditioned largely by health, mental and physical. Personal efficiency is probably rarely over half of what it should be, and in many instances less than one-third.

Educational hygiene is to-day attempting to point out the way for the correction of these lamentable conditions, which after all are rather easily corrected when intelligently faced.

Physical Defects and Diseases of Children. For purposes of convenience, a distinction is made between *defects* and *diseases* as these terms are ordinarily used in respect to the various disorders of children. A defect usually means some disorder of growth and development quite apart from a sickness. For instance, adenoids obstruct breathing but do not directly cause disease. Near-sight is a defect and so is deafness, but neither is a disease, strictly speaking. The same may be said of improper postures, irregular teeth, nervous instability, stammering, stuttering and many other disorders.

Defects and true diseases do, however, shade into each other. Of course, medical inspectors in schools deal not only with defects of growth and development, but also with a good many actual diseases, such as colds, diphtheria, scarlet fever, tuberculosis and other contagious diseases. In the main, however, they are called upon to correct *defects,* which, if neglected, handicap a child and may easily lead to serious disease either during his child life or after he is grown.

Every person of any education should understand the nature of the common defects and diseases of child life, because of their importance in relation not only to a happy childhood, but also to an efficient sort of adult life.

Physicians are constantly learning more of the intimate relations existing between disorders of health in the child and disordered health in the adult. For example, until rather recently tuberculosis, when it occurred in an adult, was supposed to have developed perhaps from a neglected cold or something else which had reduced the general health of the individual. Now we know that in the great majority of all cases of tuberculosis in adults, the disease really dates back to an infection in childhood which has perhaps lain dormant for many years. In other words, if a child can be saved from this infection during his child life,

there is relatively little danger of this disease ever appearing in adult life.

The real problem of stamping out tuberculosis, that great plague which sweeps away about one out of every ten people the world over, consists in the prevention of infection with the germ of this disease during the years of childhood. This means a thorough understanding of those conditions necessary to a healthful life in childhood. It includes such things as clean milk, from properly-tested cows; a properly-adjusted diet for older children; an abundance of fresh outside air, night and day; proper clothing; the avoidance of personal contact with people sick with tuberculosis; early attention to adenoids and diseased tonsils; the proper care of the *first teeth;* and a few other of the essentials most often neglected.

The discovery and proper treatment of diseased tonsils in childhood go far toward the prevention of rheumatism and even one form of heart disease in adults. The prevention of ordinary colds in children will often save the adult from many serious disorders, such as catarrh, deafness, rheumatism and a general low state of resistance to many of the germ diseases. It is even probable that serious kidney disease and some diseases of the circulation which carry off so many people in middle life, just when they have become the most useful to the world, are often due directly or indirectly to some of the preventable disorders of child life.

Those diseases usually called "children's diseases," such as scarlet fever, measles, whooping cough and similar ones, contrary to the usual opinion of people, do greater harm in childhood than the same diseases would in adult life. They are *all* preventable.

Modern investigators in child study show us that a child's *mental character* is largely formed before he is seven years old, and perhaps even considerably younger than this age. Now, in the same way, modern investigators of child health are showing us that the child's *physical character* is also largely formed at this same early age.

Of course it is true that unfortunate mental traits are sometimes modified or entirely changed after the age of childhood, and it is equally true that weak physical conditions are sometimes offset by later influences, but this does not alter the rule, that in most important respects, the mental and physical nature of an individual is largely fixed at an early age in childhood. The old wise saying that "the child is father to the man" is proving to have a much greater significance than we originally supposed.

If these things are true, it is clear that young people as well as parents and teachers should understand their significance, for only by such knowledge can a safe, happy and thoroughly satisfactory life be expected. There is no doubt at all that if this modern health knowledge were general and put into practical effect, human life would be lengthened on the average at least twenty-five years.

The length of human life in highly civilized countries has already been greatly increased during the last one or two centuries, largely through decreasing infant mortality. Three hundred years ago the average length of life in Europe was only half of what it is to-day. In India, on the contrary, it has remained stationary.

Now the time has come to make use of our greatly enlarged knowledge of the human body and what affects it, to increase the length of life after *middle age,* as well as in infancy and childhood. Middle age (from 45 to 55) is a period of danger to the average person. This is the time when many incurable diseases seem suddenly to develop. With a wiser care of the child many of these disorders of middle life would never develop, for in childhood we now know that the seeds of later trouble are often planted.

Nature gives us many *danger signals* if we were but wise enough to recognize them. Many of these signals physicians have come to see and understand well. Most of them should be as easily read by other people as they are by the trained doctor, for there is no mystery about them, and no very unusual powers of observation are ordinarily required. Let us consider a few of the most important of these health danger signals.

Adenoids. A mouth-breathing child nearly always has an obstruction in the back of his nose called adenoids. He breathes with his mouth open for the simple reason that he cannot breathe any other way. The open mouth is nature's *danger signal.* Such children speak with a nasal voice, a voice of dull, dead quality, possessing no resonance. They often snore at night; usually they have many colds; earache and deafness are very common; nightmares are often caused by this obstruction to breathing; nearly all cases of crooked, prominent upper teeth are produced by adenoids

adenoid children are often delicate, and prone to contract contagious diseases. No child can suffer long from adenoids without having his health seriously impaired, often for life.

A simple operation is the only cure for adenoids, and the time to have it done is *just as soon as they are discovered.*

Diseased Tonsils. Diseased tonsils are almost always found with adenoids, for tonsils and adenoids are composed of the same sort of tissue.

Frequent sore throat is a danger signal, and so are small white spots over the surface of the tonsils, even when the tonsils themselves are not sore. Healthy tonsils are small almond-shaped structures which are hardly visible in the throat. When they are enlarged so as to project into the throat from each side, they may usually be considered diseased and in need of removal. Diseased tonsils, large or small, have a close relation to rheumatism, heart disease, and to at least one nervous disease, chorea, or Saint Vitus's Dance.

It sometimes happens that tonsils which seem to give no trouble are the seat of chronic colds. In these cases the tonsils are what are called *cryptic,* and each little hole or crypt is an infected area from which germs spread to the nose and throat and set up a "cold." It is a wise thing for everybody who is subject to bad colds to have the nose and throat carefully examined by a specialist.

Defective Teeth. Probably no other one part of the body produces so much trouble as bad teeth do. Yet bad teeth are found in at least two-thirds of all school children. Some of the results of bad teeth are the following:

Indigestion.
Enlarged glands in the neck (kernels).
Poor state of nutrition.
Contagious diseases of several kinds (because germs find lodgment here).
A serious form of anaemia (deficient blood).
Headache.
Nervous disorders.
Fatigue.
Mental dullness.

The prevention of decay of the teeth is easier than the prevention of almost any other disorder in the body, yet the teeth receive perhaps the least attention. A repaired tooth is evidence of an earlier neglect.

If children's teeth from the very first received proper attention decay could be practically eliminated for a life time. Preventive dentistry is to-day the most important part of the dental profession. The common impression that first teeth may be neglected without much harm is strictly wrong. Sound first teeth are likely to assure sound second teeth.

The early loss of first teeth causes narrowing of the jaws (the jaws fail to develop), and often very crooked second teeth, for the reason that the jaws are too narrow to accommodate the second teeth. Not only this, but decay in a first tooth often spreads to the germ of the second tooth, and when this finally comes through the gums, it is already decayed. Decayed teeth, whether first or second, mean infected mouths.

A child should be taught to keep his teeth clean from the time he is three years old, and before this his parents should do it for him. After the first twenty teeth have come in, the child should visit a dentist twice a year at least for thorough cleaning and other preventive work. When this method is carefully followed, decay of the teeth with all the unpleasant consequences may be practically avoided.

The latest important discovery in dentistry is that very many roots of *dead teeth,* teeth in which the roots have been killed when the tooth was filled or crowned, afterward develop abscesses which may be entirely painless. Yet such accumulations of pus may be absorbed and cause very serious diseases in distant parts of the body. Only the X-ray will make certain whether or not such teeth have abscesses developing in their roots.

Orthodontia, or the art of straightening teeth, has been developed during the last ten years to such an extent that specialists can now straighten any teeth no matter how crooked, largely by a method of widening the jaws. Children with narrow jaws and crooked teeth should be treated as early as three years of age if necessary. It is much more difficult to straighten teeth as the child grows older.

Eye Defects. There are a good many danger signals of eye trouble in children which more often than not are unheeded. Of these the following are the most common:

Frequent headaches.
Crossed eye.
Red or painful eyes.
Peculiar postures while reading, such as holding head on one side.
Squinting or frowning.

If a child does not see words on the board clearly from his seat or if words in his books appear blurred or misty or crooked, there is nearly always some definite eye trouble. A good oculist should always be consulted when any trouble with the eyes is suspected. *Opticians* may fit glasses properly in simple un-

complicated cases, but it is always better to consult an eye specialist. The human eye is too important to take any chances with.

Neurasthenia, a nervous disease in adult life, is often caused by the neglect or mistreatment of eyes in childhood.

Nervous Disorders. Most of the nervous disorders of school children are of what are called the *functional* variety. Strictly speaking there is no such thing as a functional disorder, that is, everything has an organic origin if we were only able to find it, but the word "functional" is a convenient one to use, because it indicates a disorder for which we cannot discover the exact cause, and one which is not dangerous to life.

The common nervous troubles of children of the school age are as follows:

General nervous instability, and nervous exhaustion.
Habit spasms.
Saint Vitus's dance (chorea).
Morbid fears.
Night terrors.
Stammering and stuttering.
Epileptic fits.
Hysteria.

The two last named occur less often.

The child who is nervously *unstable* shows his disposition in ways which a teacher or a wise parent ought easily to understand. Such a child is likely to be very emotional at times, to laugh or cry easily; he has poor control of himself in general; often selfishness is a very prominent trait; concentration is usually poor, and while the child is often alert and bright, he is easily fatigued, and sometimes he is constantly fatigued. Such children are capricious in their habits, they are notional about their food, often sleep badly, and are usually below the normal weight. They seldom endure physical pain well, and in disposition are likely to be fault-finding and exacting.

It is from undisciplined children of this type that most of the neurasthenics or adult nervous people come. Sensible discipline and regular physical education are heeded by these children if they are to succeed in life. Physical defects or actual diseases are sometimes at the root of the trouble.

Habit Spasms. By habit spasms are meant peculiar "tricks" or habits, such as twitching of the eyes, rolling the eyes, sniffing, grunting, coughing, jerking the head, shrugging the shoulders, and a great variety of other things which are done almost or quite unconsciously by the child. The condition always indicates a nervously unstable disposition, and calls for attention to the general physical state of the child. Special training will do good but *nagging* will do only harm.

Saint Vitus's Dance. Saint Vitus's dance is often confused with habit spasms, but is really a much more serious disorder. The muscular jerkings are usually distributed more widely over the body. The child drops things, kicks out his feet, stumbles, has spasms of the head, neck and shoulders. Often he is unjustly criticised for habits he can in no way control. In the majority of such cases trouble will be found with the *tonsils.* Rheumatism is often present, and the heart is very frequently affected.

Rest in bed, nourishing food, and attention to diseased tonsils cure many cases. Every case of Saint Vitus's dance requires prompt, careful medical attention.

Morbid Fears. Morbid fears are found in many nervous children when one knows how to search for them, but unfortunately they are often concealed by the sensitive child. Such fears include all sorts of things of simple or complicated nature. Sometimes these fears become fixed ideas which may haunt a child for months or years. Many of the nervous disorders of adult life are directly due to uncorrected morbid fears in childhood. Such repressed fears are often forgotten but are nevertheless still present in the subconscious mind. The greatest care should be observed to prevent such fears from becoming *fixed.* These fears may be connected with religion, with punishment, death, sickness, sounds, sights, stories, persons real or imaginary, and a great host of other things.

They often quite spoil the pleasure of living and thus render the child's life utterly miserable.

Night Terrors, Stammering and Stuttering. These are nearly always evidences of an unstable nervous organization and are danger signals which should always be heeded. Their indirect causes are many but may usually be discovered. Special training for those who have speech defects is usually necessary.

Epilepsy and hysteria are much more serious than any of the other nervous troubles mentioned, but fortunately they are also less frequently observed.

Epilepsy. Epilepsy, a disease whose typical symptom is spasms, is often indirectly caused by over-strain and digestive disturbances, but the direct cause is always due to a fundamental

defect in the nervous mechanism. Immediate attention is always demanded in every case.

Hysteria. Hysteria is mentioned only to caution against the use of this word in connection with nervous manifestations of uncontrol which are really not hysterical in nature at all. True hysteria is a serious disorder when it really is present. There are generally areas in the body which are unusually painful, and others which are quite sensitive to pain. Frequently the hysterical person falls, and seems to be quite unconscious.

Often there are strange contortions of the whole body and more or less paralysis may be present. Sometimes such an hysterical person will be unable to walk for weeks, months, or years. In many cases the imagination is very strongly affected—there may be actual hallucinations. Lying and other moral delinquencies may be observed in some cases. E.B.H.

Compulsory Education

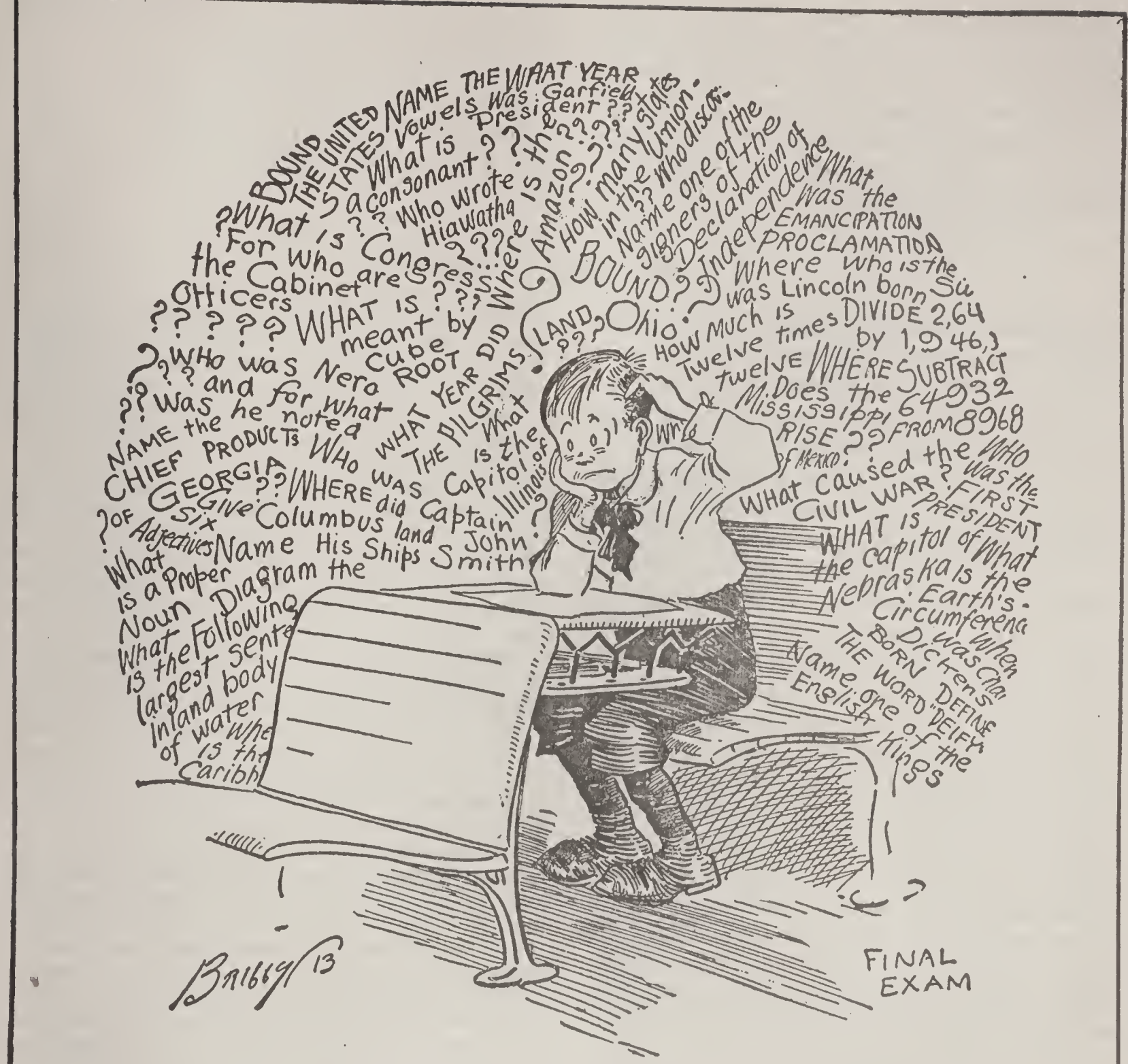
By compulsory education is meant the right of society, acting through the state, to compel a certain amount of attendance at school. The modern government may support education, it may control and manage it, and it may enforce on an individual, on the theory that education strengthens the nation. In recent years it has become more and more common for a government not only to enforce a certain number of years of school attendance, but to insist, further, that the child who has completed the required number of years of study must also possess a certain amount of knowledge. If he fails to pass the examinations which are given to determine this he is not permitted to leave school. In general, the countries which have compulsory education require the attendance of all children between the ages of six and fourteen or six and sixteen years of age, for a certain number of months during each year, either in a public or in a private school. Laws compelling such attendance are in force in Great Britain, Germany, Switzerland, Norway, Sweden, Denmark and France, but in the other European countries, while such laws may be on the statute books, they are not rightly enforced. In the United States and Canada such laws exist and are in the main very well enforced.

Canada. Compulsory attendance laws have been passed by all the Canadian provinces except Quebec. Ontario has the most efficient system of public instruction in the Dominion, and its laws for compelling attendance have served as a model for the other provinces, the regulations in each case being modified by local conditions. In Ontario parents and guardians are compelled by law to secure the education of children in their care who are between the ages of eight and fourteen, either in private or in public schools. In connection with this regulation is a labor law which forbids the employment of children under fourteen. Vicious children and those who refuse to submit to discipline must be placed in industrial schools. Every city, town and incorporated village must have one or more truant officers, and these officials are given ample authority to investigate all cases of truancy. Throughout Canada compulsory laws are enforced much more carefully in the cities than in the rural districts.

The United States. Compulsory education in the United States was first enforced in Massachusetts Colony in 1642, but the state did not require such attendance until 1852, and the first really satisfactory law was enacted in 1872. In 1878 it was provided that state grants of money could be withheld from towns which did not enforce the truancy laws. The present law prohibits the employment of children during the hours of school session and requires the presentation of a certificate issued by the school authorities in the case of employment of children under sixteen.

Connecticut had an early history similar to that of Massachusetts, but in 1872 a bill was passed which has probably given that state the best compulsory system possessed by any state. In Connecticut both the child labor laws and the compulsory education laws are in the hands of state agents, and are very rigidly enforced. The District of Columbia passed compulsory attendance laws in 1864; Vermont in 1867; New Hampshire, Michigan and Washington, 1871; New Mexico, 1872; Nevada, 1873; New York, Kansas and California, 1874; Maine and New Jersey, 1875; Wyoming, 1876; Ohio, 1877; Wisconsin, 1878; Rhode Island, Illinois, Dakota and Montana, 1883.

In about one-third of the states free books are furnished by law to those whose parents are too poor to provide them. In two states, Colorado and Ohio, local authorities are authorized to furnish free clothing for those children who have to stay away from school because they are not properly dressed. Compulsory



"When a Feller Needs a Friend"

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attendance laws have been particularly necessary because of the tendency to employ children in mines, factories and large stores and to exploit them at home. In large cities it is comparatively easy to enforce the laws, but in the country and in smaller towns it is often very difficult. Probably some of the worst examples of child exploitation may be found on farms.

Compulsory attendance laws are enforced by truant officers who are appointed by the local boards of education. These officers usually have the authority to arrest and commit to school any child to whom the law applies. If, after warning, the parents do not keep their children in school, the officer has authority to arrest the parents and bring them before the local court for trial.

Within the last few years it has become plain that three or four different types of school are necessary in any city which is determined to carry out the compulsory attendance law. There must be special institutions for those pupils who have become incorrigible and whose parents have lost control of them, because the attendance of such children in the ordinary school is harmful to the other pupils. A modification of such an institution, in the form of a day school which would add to the ordinary school course enough interesting play and work to keep the child busy all day and prevent his being on the streets, could take care

of semi-incorrigibles. Such a school would permit its pupils to go home at night. English cities provide such schools, but there are none in America. Special classes must be provided for backward children and for exceptional children. Morons (feeble-minded children or children who are physically or mentally abnormal) are usually sent to special institutions. The republic is on the way to realize the sort of specialization that will take care of every individual child in the best possible way, but there is still much to be desired. However, the child is rapidly coming into its own. See SCHOOLS. A.C.

Educational Museums

Visual instruction has become an important educational factor in the schools. The use of concrete materials, of objects and pictures, of the lantern slide, stereoscope and moving pictures as a supplement to the text-book and the teacher's description of facts and conditions, have found their way into many schools.

Efficient help in this direction has come from the museums. They have opened their great storehouses of information to the schools, and they ask the teachers to make extensive use of the wonderful things gathered from all parts of the world. Some of the museums send typical loan collections of museum material, mounted specimens of the animal world and soil and industrial products to the schools. Others invite the teachers to bring their classes to the museum and to give their lessons there, aided by the wealth of interesting specimens which are placed at their command. Still others arrange courses of lectures on certain topics of the school curriculum for pupils. Some of the institutions coöperate with the schools through two or all three of these activities.

The museums which make their illustrative material accessible to the schools may be divided into four classes:

(a) Public museums of science.
(b) Children's museums.
(c) School museums.
(d) Art museums.

The Public Museums. A brief description of the effectiveness of the assistance given public school work by some of the leading museums is given below. The information on public museums and children's museums is derived from a series of articles on *Educational Work in American Museums,* published in the reports of the Commissioner of Education of the United States (1913-1915), and prepared by Paul M. Rea:

The American Museum of Natural History. This museum, located in New York City, has a department specially assigned to coöperation with the schools of New York. It has 635 traveling exhibits, comprising more than 10,000 specimens which are in daily use in 400 schools having more than a million pupils. Lectures on geography, history and science are given every year at the museums to 40,000 or 50,000 children. Thirty thousand lantern slides, accompanied by full descriptions, are sent to the schools for use in the classroom.

The Commercial Museum in Philadelphia supplies the schools of the city and the state with large cases containing about 400 objects and 100 photographs which illustrate the peoples and products of the world and are accompanied by all necessary information and instructions. These cases become the property of the schools.

Fifteen lanterns and collections of slides are circulated in the various parts of Pennsylvania. Free lectures are given in the museum to classes of the schools. The Commercial Museum, which through its foreign trade bureau acquires valuable information and material as to commerce and industry, extends its educational work into all parts of Pennsylvania.

The Public Museum of Milwaukee. This museum loans collections of birds, small mammals, insects, Wisconsin archaeology, geology and commercial products to the schools, and such collections are extensively used. All public school children of the four higher grades of the Milwaukee schools go to the museum twice a year for a half-day visit to hear illustrated talks on some subject closely related to their class work. Lecture courses are arranged for the general public, teachers and students of normal, vocational and high schools. The museum has a special department of education, in charge of a curator.

The Charleston Museum. The Charleston (S. C.) Museum maintains a department of public instruction in charge of a curator, who arranges the work of the department with the board of school commissioners. Over seventy traveling exhibits are in regular use in the schools and are delivered by a wagon provided by the museum. Other opportunities offered to the schools are lectures on particular exhibits; special lectures at the museum to illustrate school subjects; special exhibits of educational value presented from time to time; lectures to primary teachers on nature study; the use of a room and specimens for teachers with classes.

The Buffalo Society of Natural Sciences. This was one of the first to institute a department for coöperation with the schools. Traveling exhibits are sent to the schools, and classes of the elementary schools of the city come to the museum for regular lectures and demonstrations, which are an official part of the school curriculum. Free lectures are given to the public one evening each week, from November to May.

The Fairbanks Museum of Natural Science. This institution is located at Saint Johnsbury, Vt. It gives nature lessons to classes of the public schools, in coöperation with the superintendent of schools. The pupils of the city schools from the third to the ninth grade have regular monthly lessons at the museum.

The Museum of Natural History. This museum, at Springfield, Mass., loans to the schools. Teachers with their classes go to the museum to give instruction in certain subjects, for which a classroom and illustrative material are provided.

The Park Museum. School children in groups of fifty to one hundred visit this institution, located in Providence, R. I., to receive instruction with the aid of the illustrative material in the museum.

The Cincinnati Society of Natural History. This museum circulates school cabinets containing collections of birds, insects and minerals, accompanied by explanatory literature. Illustrated lectures are given to the general public one evening each week.

The Chicago Academy of Sciences. Classes of the city schools are invited to study in the museum a large series of *habitat* area and the celestial sphere, a mechanical device for the study of heavenly bodies. A children's science library and story hour conducted by the librarian are among other opportunities afforded the children.

The Newark Museum Association. This museum, at Newark, N. J., loans to the schools rocks, birds, butterflies, phyiographic models and industrial collections. Its library circulates in the schools books, magazines, newspaper cuttings, pictures, charts, etc. Each year the museum has a special exhibit covering some human industry, which is shown and explained to school classes.

The Public Museum of the Staten Island Association of Arts and Sciences offers illustrated talks on school subjects to children above the fourth grade on Friday afternoons from October to April.

The California Academy of Sciences, San Francisco, began planning in 1916 the circulation of natural history cabinets in the city schools.

The Oakland Public Museum, Oakland, California, sends to the schools a series of loan collections. An excellent exhibit of American colonial material is made the basis of lectures to school children and teachers. Other lectures on history and nature, closely correlated with the course of study in the public schools, are also provided.

The Museum of History, Science and Art, Los Angeles, California, is organizing a system of educational work for the public schools modeled after that of the Milwaukee public schools.

The Academy of Sciences, Davenport, Iowa, conducts nature classes in the museum, provides for lectures to teachers and neighborhood groups and for a series of "museum talks" on Sunday afternoon. Field trips for pupils of the schools are undertaken in the spring. There is no formal coöperation with the schools.

Children's Museums. *The Children's Museum* of Brooklyn, N. Y., a branch of the Central Museum of the Brooklyn Institute of Arts and Sciences, was the first museum organized solely for children in the United States. Its object is—

> To form an attractive resort for children with influences tending to refine their tastes and elevate their interests.
>
> To create an attractive educational center for daily assistance to pupils and teachers in connection with school work, and to offer new subjects of thought for pursuit in leisure hours.

The scope of work of the museum is the preparation of collections which the children can enjoy, understand and use; an arrangement of material pleasing to the eye and expressive of a fundamental truth; briefly descriptive labels expressed in simple language; a system of instruction which children will voluntarily employ. The museum building has twelve exhibition rooms, a lecture hall and a library. In the exhibit rooms are collections of natural history, geography, United States history and art. The institution is very popular, and the average attendance is more than 100,000 children a year. While there are no official relations between the museum and the public school, the exhibits are correlated as far as practicable with the public school work, and lectures supplementing the courses of study are regularly given during the year.

The Children's Museum, Boston, Mass., was opened in 1913 in response to the desire of a group of teachers for some adequate assistance in presenting the subject of nature study to their classes. The material at the service of the children consists of exhibits illustrating various departments of natural history, ethnology and industry, flower tables, etc. Three hundred lectures are given a year, and the average daily attendance of children is upward of 200.

The Children's Museum of the United States National Museum. The United States National Museum maintains a museum for the children of Washington "for the benefit of very young people, their entertainment, rather than instruction, as an attractive means of inculcating a love of nature." The exhibit comprises familiar American birds; common European birds, interesting water birds, curious birds, such as the crocodile bird, etc.; brilliantly-colored birds, curious nests and eggs; specimens, with accessories, representing protective mimicry; remarkable insects; bright-colored shells; other interesting invertebrates; remarkable minerals.

School Museums Proper. Among museums of this class the following may be noted:

The N. W. Harris Public School Extension of the Field Museum of Natural History in Chicago. In 1911 Mr. Norman W. Harris of Chicago gave the Field Museum an endowment of $250,000, the income from which is to maintain a special museum for the use of the public schools of Chicago. The new school museum opened its

doors in 1913. It is a traveling museum which sends cases of zoölogical, botanical and geological material to the schools. Economic collections which are useful in the study of geography and commerce for the illustration of production and distribution form part of the material in circulation. The cases present small animals, birds, fishes, plants, minerals, etc., in lifelike imitation of their natural surroundings. They are delivered at the schools by an automobile, remain for two weeks and are then replaced by others.

The Educational Museum of the Saint Louis Public Schools is the only museum in the United States which is a regular part of the school system. It is a traveling museum. The material, consisting of 2,000 individual and 8,000 duplicate collections for circulation, is grouped and arranged in accordance with the course of study, and is used in direct connection with the school work. Each school has a delivery day once a week. The principal orders the material that is to be used in his school for the illustration of classwork during one week, and two days later the museum automobile truck delivers the material and takes back what had been used during the previous week. Each teacher has a catalogue.

The groups of material are food products, materials for clothing, other natural products, industrial products; the animal world; plants, and models and charts of plants, minerals, rocks and ores; articles and models illustrating the life and occupations of the different peoples of the world; apparatus for the illustration of physics and physical geography; charts, photographs, maps and objects illustrating history; charts and objects illustrating physiology; literary and musical records for the school phonographs; and photographs, stereoscopic views and lantern slides to accompany the preceding groups. During the year 1915 over 70,000 collections were sent to the schools.

A teachers' library of 10,000 volumes, consisting of books on philosophy, psychology, education, school management, text-books used in the United States and other countries, reports and courses of study from all parts of the world and reference books on everything the museum contains, furnishes books to the teachers by the museum automobile. Nearly 4,200 books were in circulation in 1915.

A study exhibit, which gives the teachers of the city the opportunity to make themselves familiar with the different types of material for circulation in the schools, is placed in two large adjoining rooms of the museum building. In glass cases there are exhibited in the order of the catalogue one or two types of each of the 2,000 individual collections, the whole display constituting an open catalogue. Reference books, the titles of which are given at the head of each group in the catalogue, are at the teachers' service. All the students of the Harris Teachers College—Saint Louis employs only graduates of this institution in its elementary schools—receive a thorough training in the use of the material. In the winter and summer extension classes of the college courses in the use of illustrative material are also given.

The United States National Museum is not in a position to conduct any of the usual forms of extension work, but has coöperated with the schools in a very efficient and successful way by distributing among schools and colleges valuable material for the illustration of school work.

Art Museums. The following art museums in the United States have established a system of coöperation with the schools of the cities in which they are located:

The Museum of Fine Arts, Boston.
The Worcester, Mass., Art Museum.
The Rhode Island School of Design, Providence.
The Parrish Art Museum, Southampton, L. I.
The Arnot Art Gallery, Elmira, N. Y.
The Albright Art Gallery, Buffalo, N. Y.
The Carnegie Institute, Department of Fine Arts, Pittsburgh, Pa.
The Minneapolis Institute of Arts.
The City Art Museum, Saint Louis, Mo.
The Western Gallery of Art, Kansas City, Mo.
The Toledo Museum of Art.

J.W.W.

Canadian Museums. Strictly speaking, there are no educational museums in Canada. There is a museum in connection with the Department of Education in Toronto, which issues an archaeological report, relating particularly to archaeology in Ontario. In the same city is the Royal Ontario Museum, partly operated by the Ontario government and partly by the University of Toronto, which covers everything from fine arts to mining.

In Ottawa, connected with various departments of the Federal government, are museums, and there are a few small collections connected with various historical societies throughout the Dominion, especially in the Province of Ontario. The largest collection of Canadian prints, so far as known, is in the museum of historical pictures relating to Canada, in the Public Library in Toronto; this is known as the John Ross Robertson collection. G.H.L.

National Education Association

This name is applied to a society of teachers and educators of the United States, organized at Philadelphia, in 1857, as the National Teachers' Association, and incorporated under its present name in the District of Columbia in 1886. A number of similar but smaller associations were founded early in the nineteenth century. One of the best known, the American Institute of Instruction, organized in 1830, covered New England; another was organized in Ohio, and still another in Philadelphia. In 1856 the presidents of twelve of the state asso-

ciations sent out a call for a general association to "advance the dignity, respectability and usefulness" of the teaching profession and the science of education, "by distributing among all the accumulated experience of all."

With so general an aim the association grew but slowly, and it was not until 1870, when it began to divide into departments and to specialize, that growth became rapid. This specialization made the organization much less unwieldy and increased its usefulness. The association includes the National Council, an advisory body of 120 members, the Department of Superintendents, and eighteen other departments, covering practically every phase of educational work. Excepting those of the Department of Superintendents, the annual meetings of these departments occur at the time of the annual meeting of the association, which is usually held the first week in July. The Department of Superintendents includes in its membership all the leading educators of the country. It holds its regular meeting the last week in February or the first week in March. and most of the other departments hold special meetings at the same time and place.

An *Annual Report,* a comprehensive account of the work accomplished, is also issued. This report records some of the most important educational advances and discoveries which are being made. Some of the reports which have promoted much discussion and have had far-reaching effects are an investigation and report on the secondary school course (1892); on elementary schools (1895); on rural schools (1897); on college entrance requirements (1899); and on teachers' salaries (1913 and 1914).

There are about 10,000 active members of the association, but a great many more than that number attend the annual July meetings, for the larger proportion consists of associate members, who are permitted to attend meetings but may not hold office. A.C.

Education for the Home

The difficulties and trials of wives and mothers in remote rural districts, far from post office, school or library, for years have been the special problem of the United States Bureau of Education. Pathetic appeals for help in the care and education of their children, sent by thousands of women throughout the country, have brought vividly before the officials of the Bureau the need for a special department to take care of these isolated mothers. Accordingly, a home-education division has been organized in the Bureau. The objects of this branch of the work are stated as follows in a recent bulletin:

> To help parents in the home education of their children with reference to health, games and play, early mental development and formation of moral habits; to interest boys and girls who have left school and are still at home, by directing their home reading and study, and to further the education of the parents in the home.

In the hope of reaching as many homes as possible, the Bureau coöperates with the National Congress of Mothers and Parent-Teacher Associations (which see). County superintendents were asked to furnish names of women in their communities on whom the Bureau could rely for aid in securing mailing lists; in this way, and through other channels, the Bureau obtained the names of about 40,000 women who desired help in the care and home training of children. This number will, of course, be constantly increased. Assistance is given through the medium of helpful bulletins on "home matters"—for example, material for home study, literature on moral training, plans for reading courses and suggestions for organizing sewing and cooking classes and parent-teacher associations. In some states efforts are being made to reach isolated people by means of traveling libraries and similar agencies, but these do not usually meet the needs of mothers who are trying to train their children according to sound principles of development. To these women the home-education division is a timely and special aid, and with their help must become valuable. See PARENT-TEACHER ASSOCIATIONS. See subtitle below, *United States Bureau of Education.* B.M.W.

United States Bureau of Education

This Bureau in the Interior Department was created by Congress in 1868 to gather and distribute information on education. Owing to the strong objection by Congress and the states to any interference with the state educational systems by the national government, the work of the Bureau has always been of an advisory nature. The chief officer has the title of Com-

missioner of Education, and is appointed by the President with the consent of the Senate. For several years there has been an endeavor strongly supported by educators to raise the Bureau of Education to the rank of an executive department of the government, in which event the Commissioner of Education would become a member of the President's Cabinet with the rank of Secretary.

The Bureau is organized into a number of divisions, the most important of which are those of school sanitation and hygiene, higher education, school administration, rural education, and the editorial and library division. The Bureau is engaged in collecting and distributing information bearing upon educational matters, and in giving assistance to any state or locality along educational lines, when such assistance is desired. The annual *Reports* of the Commissioner to Congress are among the most important records of American education. *Circulars of Information* and *Bulletins* are also published. These may be obtained by any one interested in education by asking for them. Specialists are employed in each of the divisions, who attend educational conventions, carry on investigations and deliver lectures whenever they are called upon to do so. The Bureau is sustained by appropriations made by Congress, but the appropriations are not sufficient to enable the Bureau adequately to meet the demands of the country. The first Commissioner, appointed in 1867, was Henry Barnard, who served three years. His successors, with their terms of service, are as follows: John Eaton, 1870-1886; Nathaniel H. R. Dawson, 1886-1889; William T. Harris, 1889-1906; Elmer E. Brown, 1906-1911; Philander P. Claxton, 1911, 1921; John J. Tigert, since 1921.

Consult Monroe's *Cyclopaedia of Edueation;* Butler's *The Meaning of Education;* Dewey's *The School and Socicty;* Hughes' *Mistakes in Teaching;* Compayré's *History of Pedagogy;* Monroe's *History of Education*, and the *Reports of the United States Commissioner of Education.*

Related Subjects. The more general phases of the subject of education are treated under the subtitles in the above article, but many special topics are given separate treatment in these volumes. The following articles have a close connection with the subject. Many of these in turn have lists of related topics, so that the reader is given a very wide range.

GENERAL

Abacus
Academy
Adolescence
Agriculture
Alma Mater
Blind, Education of the
Business College
Child
Child Study
Coeducation
College
Conservatory
Corporal Punishment
Correlation
Deaf and Dumb
Deductive Method
Drawing
Elective Studies
Extension Teaching
Feeble-minded, Education of
Fellowship
Games and Plays
Gardening
Gary School System
Gymnasium
Household Arts in Education
Indians, American, subhead *Indian Education*
Industrial School
Intelligence, The Measurement of
Kindergarten
Law Schools
Lyceum
Medical Schools
Mental Handicaps
Methods of Teaching
Montessori Method
Motivation of Teaching
Negro
Normal School
Parent-Teacher Associations
Peabody Educational Fund
Pedagogics
Rhodes Scholarships
School Garden
Schools (with numerous subheads)
Slater Fund
Sloyd
Story Telling
Teachers' Institute
Technical and Industrial Education
University
University Extension
Vocational Guidance
Wrangler

IMPORTANT SCHOOL SUBJECTS

Algebra
Anatomy
Archaeology
Arithmetic
Astronomy
Botany
Calculus
Chemistry
Civil Government
Geography
Geology
Geometry
Grammar
Industrial Art
Language
Literature
Manual Training
Mathematics
Mechanical Drawing
Mineralogy
Natural History
Nature Study
Penmanship
Philology
Philosophy
Phonetics
Physical Culture
Physics
Physiology
Psychology
Reading
Rhetoric
Sanitary Science
Shorthand
Sociology
Spelling
Trigonometry
Writing
Zoölogy

EDUCATIONAL INSTITUTIONS

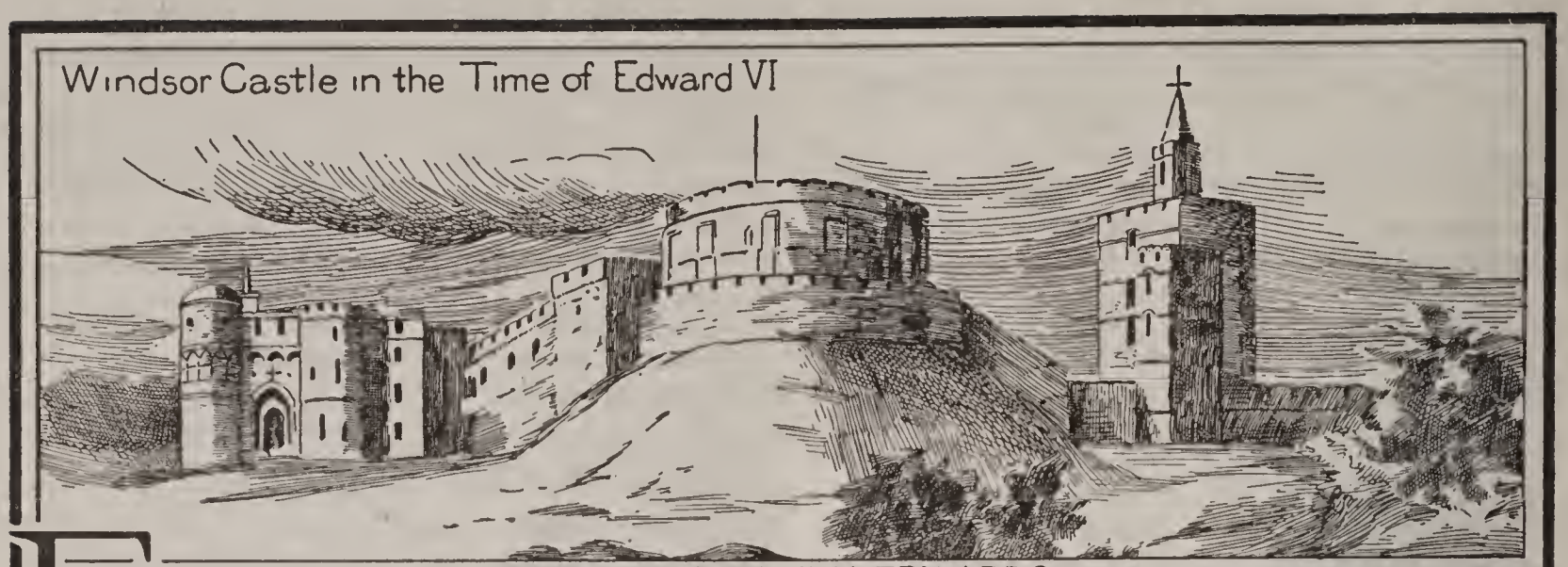
Acadia University
Alabama, University of
Alberta, University of
American University
Amherst College
Arizona, University of
Arkansas, University of
Armour Institute of Technology
Barnard College
Berea College
Berlin, University of
Boston University
Bowdoin College
British Columbia, University of
Bryn Mawr College
California, University of
Cambridge, University of
Carnegie Foundation
Carnegie Institution
Catholic University of America
Chautauqua Institution
Chicago, University of
Cincinnati, University of
Clark University
Colorado, University of
Columbia University
Cornell University
Dalhousie University
Dartmouth College
Denver, University of
De Pauw University
Drexel Institute

Edinburgh, University of (subhead under EDINBURGH)
Eton College
Fisk University
Florida, University of
Georgetown University
George Washington University
Georgia, University of
Girard College
Hampton Normal and Agricultural Institute
Harvard University
Idaho, University of
Illinois, University of
Indiana University
Iowa, University of
Iowa State College of Agriculture and Mechanic Arts
Johns Hopkins University
Kansas, University of
Kentucky University
Knox College
Laval University
Leland Stanford Junior University
Lick Observatory
Louisiana State University
McGill College and University
Maine, University of
Massachusetts Institute of Technology
Michigan, University of
Minnesota, University of
Mississippi, University of
Missouri, University of
Montana, University of
Mount Allison University
Nebraska, University of
Nevada State University
New Mexico, University of
New York, College of the City of
New York, University of the State of
New York University
North Carolina College of Agriculture and Mechanic Arts
North Carolina, University of
North Dakota, University of
Northwestern University
Notre Dame, University of
Oberlin College
Ohio State University
Oklahoma, University of
Oregon, University of
Oxford University
Paris, University of
Pennsylvania, University of
Princeton University
Purdue University
Queen's University
Radcliffe College
Rugby School
Saskatchewan, University of
Smith College
South Carolina, University of
South Dakota, University of
Syracuse University
Tennessee, University of
Texas, University of
Toronto, University of
Tufts College
Tulane University of Louisiana
Tuskegee Normal and Industrial Institute
United States Indian Industrial and Training School
Utah, University of
Valparaiso, University of
Vanderbilt University
Vassar College
Vermont, University of
Virginia, University of
Washington, University of
Washington and Lee University
Washington University
Wellesley College
Western Reserve University
West Virginia, University of
William and Mary College
Williams College
Wisconsin, University of
Wyoming, University of
Yale University

EDUCATORS

Adams, Charles Kendall
Adams, Frank Dawson
Alderman, Edwin A.
Andrews, Elisha Benjamin
Angell, James Burrill
Armstrong, Samuel Chapman
Arnold, Thomas
Barnard, Frederick A. P.
Barnard, Henry
Brown, Elmer Ellsworth
Bryce, George
Burwash, Nathanael
Butler, Nicholas Murray
Calder, James Alexander
Cameron, Agnes Dean
Carman, Albert
Claxton, Philander P.
Coleman, Arthur P.
Comenius, John Amos
Dawson, Sir John William
De Mille, James
Dewey, John
Draper, Andrew Sloan
Duncan, Norman
Eliot, Charles William
Fenelon, François de Salignac
Froebel, Friedrich Wilhelm August
Garfield, Harry Augustus (subhead under GARFIELD)
Gilman, Daniel Coit
Grant, George Monro
Hadley, Arthur Twining
Hall, G. Stanley
Harper, William Rainey
Harris, William Torrey
Hibben, John G.
Hopkins, Mark
Hughes, James Laughlin
James, Edmund Janes
Jordan, David Starr
Judson, Harry Pratt
Low, Seth
Lowell, Abbott Lawrence
Lowell, James Russell
Lyon, Mary
Mann, Horace
Mather, Increase
Montessori, Maria
Northrop, Cyrus
Norton, Charles Eliot
Page, David Perkins
Palmer, Alice Freeman
Parker, Francis Wayland
Pestalozzi, Johann Heinrich
Ryerson, Egerton
Schurman, Jacob Gould
Shaeffer, Nathan C.
Stoner, Winifred Sackville
Sturm, John
Swett, John
Tyler, Moses Coit
Van Hise, Charles Richard
Vincent, George Edgar
Washington, Booker T.
Wheeler, Benjamin Ide
White, Andrew Dickson
White, Emerson
Willard, Emma Hart
Wilson, Woodrow
Woolsey, Theodore Dwight
Yale, Elihu
Young, Ella Flagg

EDUCATION, COMMERCIAL. As in so many other educational movements, Germany was the pioneer in the field of commercial education, and even before the beginning of the nineteenth century provided business instruction in some of its schools. Not until about the middle of the nineteenth century, however, did the United States awaken to the value of such work. The first commercial schools were private enterprises (see BUSINESS COLLEGE), but the states soon saw the necessity for providing for such pupils as could not afford to pay tuition, as well as for such as desired a less strictly commercial course than was given by the business colleges. The result was the introduction of business courses into many of the public high schools. At first these attracted comparatively few pupils, but as it became apparent that the courses offered were as thorough as those given in most business colleges, they became very popular.



ENGLAND'S SEVEN EDWARDS

EDWARD, a royal name in English history, borne by seven monarchs since England became a united nation through the conquest of William I, in 1066. The first was named for Edward the Confessor, who ruled Anglo-Saxon England in the eleventh century. Of the seven Edwards, Edward VII is the most notable, because of his influence on twentieth-century life.

Edward I (1239-1307), whose fame as a lawgiver has won him the title the "English Justinian," succeeded his father, Henry III, in 1272. The news of the latter's death reached him on his way home from the Crusades undertaken by Louis IX of France, and he was not crowned until 1274. Shortly after his return to England he began war on the Welsh, whom he subdued after a struggle that lasted nearly ten years. In 1282 Wales became a part of the English realm, and Edward made his little son feudal lord of the Welsh, with the title of Prince of Wales.

The greater part of his reign was given over to the attainment of his great ambition, the possession of Scotland. In 1290 there were several claimants to the Scottish throne, chief of whom were Robert Bruce and John Baliol. Edward, asked to decide between them, chose Baliol, but on condition that he pay homage to the English king as his superior.

The brave Scottish people, humiliated by this condition, rose in arms, and in 1306, after a long struggle of varying fortunes, Robert Bruce, grandson of Baliol's rival, was crowned at Scone. Edward sent an English army to Scotland to subdue the new king, and soon after set out himself for the north, but died within "sight of the country which he had devoted to destruction" (Hailes). During the war he carried off to London the great Stone of Scone, upon which the Scottish kings had been crowned for centuries. This famous stone now rests beneath the seat of the coronation throne of the English monarchs in Westminster Abbey.

In home affairs Edward was one of the greatest kings of his time. He established order in England, improved the law and made regular the representation of the Commons in Parliament. One of his most important decrees was that the right of levying taxes rested with Parliament.

Edward II (1284-1327), the first English monarch to bear, as son of the king, the title Prince of Wales, succeeded his father Edward I in 1307. He was a weak and incompetent ruler, constantly under the influence of unscrupulous favorites, which led to rebellions on the part of his nobles. The war begun by his father against the Scotch was continued by this king, but with ill success, and Scottish independence was assured in 1314, by the great victory at Bannockburn. Edward invaded Scotland again in 1322 but he was forced to conclude a truce of thirteen years and to return to England. Finally, he was deposed by a conspiracy of his wife and the great nobles of the kingdom, and in 1327 was murdered in Berkeley Castle.

Edward III (1312-1377), son and successor of Edward II, was the king in whose reign the memorable Hundred Years' War with France began. Before he commenced the struggle with the French he invaded Scotland and laid that country waste, winning a number of victories that were only of temporary importance. He could not crush the Scotch spirit of independence.

Edward brought on the war with France by laying claim to the French crown, and in 1346 won the first great combat of the struggle, the famous Battle of Crécy. In this battle he was assisted by his son, the Black Prince, a cour-

ageous lad of sixteen. Calais fell to the king's army after a year's siege, and in 1356 the Black Prince inflicted a terrible defeat on the French at Poitiers, capturing their king. Later, the English were less successful, and in 1375 Edward withdrew from the struggle because his country was exhausted. During the last years of his reign he quarreled constantly with Parliament, the members of which were aided in their opposition by the Black Prince.

Edward IV (1442-1483) came to the throne in 1461, when the rival houses of York and Lancaster were engaged in the Wars of the Roses. Edward's father, Richard, Duke of York, was the grandson of the fourth son of Edward III, the rival line of Lancaster being descended from John of Gaunt, the third son. In 1460 Richard was defeated and slain at the Battle of Wakefield, and Edward, placing himself at the head of the Yorkist party, led his forces to victory at Towton Field (March, 1461) and won the crown from the helpless Henry VI.

His hold on the throne was not secure, however, and when in 1469 the powerful Earl of Warwick went over to the side of the Lancastrians Edward was forced to flee from England. Two years later he returned, gathered together an army and reëstablished his claim to the kingship by the decisive victories of Barnet and Tewkesbury. The remainder of his reign was peaceful and was marked by his policy of strengthening the royal power. In this manner he paved the way for the absolute monarchy under the Tudors. During Edward's reign printing and silk manufactures were introduced into England.

Edward V (1470-1483) succeeded his father, Edward IV, at the age of thirteen. Richard, Duke of Gloucester, the cruel and unscrupulous uncle of the young king, at once proclaimed himself Protector of the Kingdom, and sent Edward and his younger brother prisoners to the Tower of London. There they were smothered to death by one of Richard's nobles, and the Duke became king as Richard III. The pathetic story of the murdered princes is given poetic treatment in Shakespeare's *King Richard III*.

Edward VI (1537-1553), the son of Henry VIII by his third wife, Jane Seymour, succeeded his father in 1547. Edward was one of the boy kings of England, for he was only ten when he came to the throne, and he died at the age of sixteen. During the greater part of his reign the affairs of the kingdom were in the control of the king's uncle, Edward Seymour, Duke of Somerset. During this period Protestantism was established as the state religion. In 1549 the *English Book of Common Prayer* was prepared by Archbishop Cranmer, and in 1552 the famous Articles of Religion were published.

Edward VII (1841-1910), whose title in full was "King of the United Kingdom of Great Britain and Ireland, and of all the British Dominions beyond the Seas, Emperor of India," was the eldest son of Queen Victoria and

ALBERT EDWARD (EDWARD VII)
Son of Queen Victoria and father of George V.

the Prince Consort, Albert. He was born in Buckingham Palace on November 9, 1841, was christened Albert Edward, and by right of inheritance received the title Prince of Wales at his birth. The Prince was educated in a manner befitting the heir apparent to the British throne, and among his early tutors was the novelist, Charles Kingsley. His university training consisted of a session at the University of Edinburgh, a year at Christ Church, Oxford, and four terms at Cambridge. In 1860 he visited Canada and the United States, where he was most cordially welcomed, and two years later, in company with Dean Stanley, traveled through Egypt, Palestine and India.

In 1863, then twenty-one years of age, Prince Albert Edward took his seat in the House of Lords, formally beginning his public life. The same year he married Princess Alexandra, eldest daughter of Christian X of Denmark, who came to be greatly loved by the English peo-

ple. To them were born six children: Prince Albert Victor, Duke of Clarence, who died in 1892; Prince George Frederick, who succeeded his father in 1910 as George V; Princess Louisa Victoria, after her marriage, the Duchess of Fife; Princess Victoria Alexandra; Princess Maude Charlotte, who married Prince Charles of Denmark; and Prince Alexander John, who died the day following his birth.

During the long period of Queen Victoria's widowhood and partial retirement, the Prince represented his mother both in society and at countless public gatherings, everywhere winning popularity by reason of his tact and good judgment. He was an enthusiastic patron of art and science, and kept up a friendly interest in various charitable enterprises, but especially did he win the affection of his future subjects by his activity as a sportsman. None of the English country gentlemen of his time cultivated more eagerly than he yachting, horse racing and the other popular British sports.

On his accession to the throne in 1901, he assumed the name Edward VII. In 1902 and again in 1904 he visited Ireland, holding court at Dublin and being received with great enthusiasm by his Irish subjects. During his reign King Edward was untiring in his efforts to promote cordial relations between Great Britain and the other nations and was influential in the negotiation of treaties with Japan, France, Italy and Russia. His pleasing personality and gracious manners were turned to good account in important state visits to the rulers of Germany, Russia and France, and his influence in maintaining European harmony was such that he was generally known as the "Peacemaker." He died suddenly on May 6, 1910. B.M.W.

Related Subjects. The following articles in these volumes will make more clear certain references in the above article:

Articles of Confederation	Crécy
Articles The Thirty-nine	Crusades
Bannockburn	Hundred Years' War
Bruce, Robert	Prince of Wales
Coronation (subhead *Coronation Stone*	Roses, Wars of the

EDWARD, known as THE BLACK PRINCE (1330-1376), was the eldest son of King Edward III of England. He was called the Black Prince because he chose black for his armor when he led part of the English forces at the great Battle of Crécy, on August 26, 1346, in France, when he was only sixteen (see CRÉCY).

After the great Battle of Poitiers in 1356 he took the French king prisoner, and the story is told that he rode on a pony beside the captive, who was mounted on a fine white horse. The Black Prince, who died before his father, encouraged the woolen trade for England and through his efforts was founded the woolen trade at Yorkshire. His tomb with his black armor hanging over it is to be seen in the cathedral at Canterbury.

EDWARD THE CONFES'SOR (1004-1066), for twenty-four years a quiet, unassuming king of England, and the founder of Westminster Abbey (which see). After spending the early part of his life in Normandy, Edward, who was one of the sons of Ethelred the Unready, was called to the throne at the death of his half-brother Hardecanute. The Saxon line was thus renewed, but for a long time Earl Godwine, whose daughter Edward had married, was the leading factor in the government. The king cared little for political affairs, as he had the qualities of a monk rather than of a king. He favored the Normans to a great extent and aroused the wrath of Earl Godwine's party, for the Norman element continued to increase in strength and power. William the Norman, who became king when he conquered Edward's successor, claimed that Edward left him the kingdom of England in his will (see WILLIAM I, THE CONQUEROR). Edward was canonized by Pope Alexander III and given the title of Confessor in 1161.

EDWARDS, HARRY STILLWELL (1855-), an American author, best known for his stories of life in the South. His *Sons and Fathers* attracted wide attention, partially because of its dramatic treatment of a certain vital phase of heredity, but chiefly because it won over eight hundred competitors a prize of $10,000 offered by the *Chicago Record.* Among his other stories are *The Marbeau Cousins, Fifth Dimension* and *His Defense;* and he also wrote numerous poems and songs.

Edwards was born at Macon, Ga., and has always lived in the South, among the people whose dialect he reproduces so skilfully in his works. He studied law at Mercer University in his native town, but did not practice, taking up journalism instead. After serving as editor of various Macon papers he became, in 1900, postmaster of the city, and held that position for thirteen years. In 1904 he attended the Republican National Convention in Chicago as delegate-at-large, and seconded on behalf of the South, the nomination of Roosevelt.

EDWARDS, JONATHAN (1703-1758), an intellectual leader among scholars and theologians

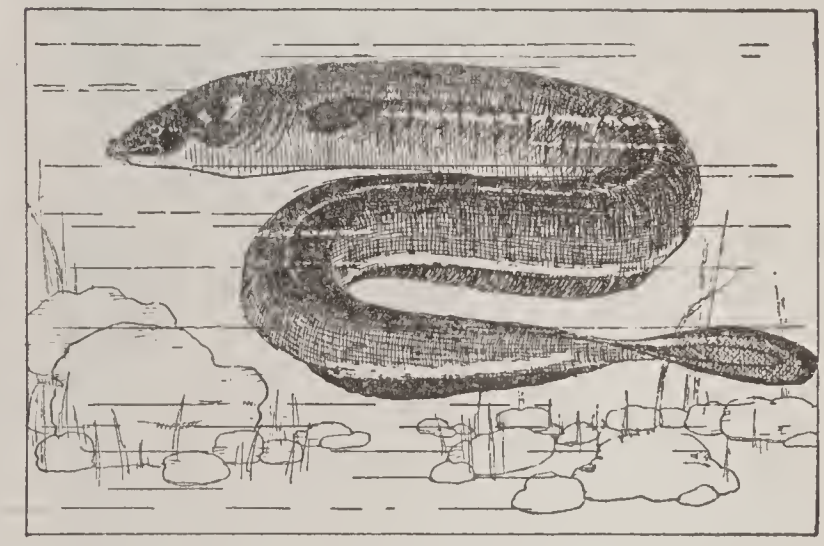
in New England, whose fame still lives in an extraordinary book entitled *An Inquiry into the Freedom of the Will.* This work, which is a defense of the doctrines of foreordination, original sin and eternal punishment, is a masterpiece of philosophical reasoning. It has been called "the one large contribution which America has made to the deeper philosophic thought of the world." Edwards was born in Connecticut, and after graduating from Yale at the age of seventeen became tutor in that college for three years. He then became pastor of the church at Northampton, Mass., where he remained until 1750, when he resigned his charge and entered into missionary work among the Indians. Just a few weeks before he died he was chosen president of Princeton College.

JONATHAN EDWARDS

ED'WARDSVILLE, Pa., a residential borough of Luzerne County, with a mixed population which increased from 8,407 in 1910 to 10,443 in 1916. Welsh predominate in the foreign element. The borough is situated in the northeastern part of the state, twenty miles southwest of Scranton, and on Toby's Creek, a branch of the Susquehanna River. Electric lines connect it with Wilkes-Barre, two miles east, where railroad transportation is provided by the Delaware, Lackawanna & Western, the Lehigh Valley and the Pennsylvania lines. Edwardsville is largely interested in coal mining, about 6,000 people being engaged in this industry. The notable buildings are a $21,000 town hall and a $25,000 Congregational Church. There are three playgrounds, a park, a high school and a library. The borough was incorporated in 1885. *Edwardsville* is the official name of the post office. T.H.W.

EEL, the name applied to a species of long, practically scaleless fish with slimy skin, the common variety of which is found in the rivers and fresh waters of Europe (except those draining towards the Arctic Ocean), of the Black Sea and the Caspian Sea, and also on the Atlantic side of North America. The eel goes to salt water only to lay and hatch its eggs; it feeds upon all sorts of refuse, preferring dead fish and other animal matter. It is particularly fond of shad, and has been known to devour the contents of nets left out but a short time. The food value of the flesh of the eel has long been known, but many are prejudiced against it because of the repulsive, snakelike appearance. These fish are caught by hand and set lines, eel spears, eel pots and weirs (fences of stakes set in the stream).

The *conger eel* is much larger than the common eel, and lives in salt water. Another interesting variety is the *electric eel,* found in South American waters, which grows to a length of six feet (see Electrical Fish). According to Humboldt, the German scientist, the natives of South America take their horses



COMMON EEL

to streams inhabited by these eels, which exhaust their supply of electricity in attacking the animals and are then easily captured. Zoölogists classify eels as a degenerate type of fish.

EGBERT (? -839), the first king of the English, who subdued all other Saxon kings and in 829 united all the inhabitants of Britain under one ruler. Having spent several years at the court of Charlemagne, he had seen that great ruler make himself master of most of Western Europe, so he was not content to remain simply king of Wessex. In a series of wars he conquered Cornwall, Mercia, Kent, Sussex and Essex, and thus a great step was taken towards the political union of the different sections.

EGERIA, in Roman mythology, a nymph or stream goddess who fell in love with King Numa and became his wife. His wise organization of the religious life of the state was largely due to her influence. After his death she mourned so unceasingly that Diana, either in wrath or in pity, transformed her into a spring.

EGG. There is an old question which in times gone by wise men did not scorn to puzzle their brains about, and which even to-day is occasionally propounded just to cause confusion—"Which came first, the hen or the egg?" It is a question which admits of no answer, for each is absolutely essential to the existence of the other. In all ranks of life above the very lowest, where reproduction takes place by simple division, it is impossible for young animals to be produced except from eggs. In the highest of all classes, the mammals (which see), it takes the egg a long time to develop, and it remains in the body of the female until it is hatched. Even then the young animal is not brought forth at once, but is sheltered within the body of the mother until it has partially matured.

But in far more numerous cases animals lay their eggs to be hatched later, and it is eggs of this sort which are ordinarily meant when the term is used. Worms, mollusks, insects, fishes, birds, reptiles—all these are egg-laying animals; and though their eggs differ in size, in shape and even in their constituent parts, they are all alike in one thing.

What Is an Egg? This one thing which all eggs must possess is the *embryo, nucleus,* or *germ,* from which the young animal develops. It is always small, and frequently so tiny as to be almost invisible, but it is the only part of the egg which has in it the possibility of life. All the other parts, frequently bulky in proportion to the size of the nucleus, are for food and for protection. The eggs of insects and of many of the lower animals, frequently produced in amazing numbers, are imperfect—that is, they do not possess the protective coverings which form part of the eggs of birds. If they did, and thus escaped in larger measure the destruction which waits for them on every side, the world would literally swarm with the young which would come from them.

A Typical Egg. Most perfect and most interesting, as well as of most importance commercially, are the eggs of birds. A bird's egg consists of five parts: (1) the shell; (2) the double membrane lining the shell; (3) the white; (4) the yolk; and (5) the germ.

(1) The *shell,* which usually makes up about eleven per cent of the weight of the egg, is formed almost wholly of carbonate of lime. The eggs of some birds are as smooth and shiny as enamel, while others are dull and rough; some are white, or nearly so; others exhibit exquisite tints and markings, such as the olive-brown spots on the grayish-white eggs of the bobolink, or the reddish-brown marks on those of the meadow lark; but in any case they all fulfil their one purpose, which is that of protection. The smaller the bird, the thinner the eggshell is likely to be, for a tiny humming bird could not possibly peck its way through the thick covering from which the young ostrich chick emerges with ease.

(2) The thin, tough *membrane* which lines the shell and gives it added strength is somewhat felty and elastic. As stated above, it is double, and at one end the two layers are widely separated, an air-chamber filling in the space between the two. This air, it is believed, is breathed by the little chick while it is pecking its way out.

(3) The *albumen,* or *white,* a food layer which contains a large proportion of water, has running through it two threads, or *chalazae;* everybody has noticed them, with impatience, probably, in a soft-boiled egg. Their function is to hold the yolk in its place in the surrounding white, and they are able to perform this steadying task because they are fastened to the lining membrane.

(4) The *yolk,* a yellow ball surrounded by a thin, transparent membrane, is composed of one cell, the largest single cells known being the yolks of the larger birds' eggs. This yolk is a very rich, concentrated food, easy of digestion by the developing birdling.

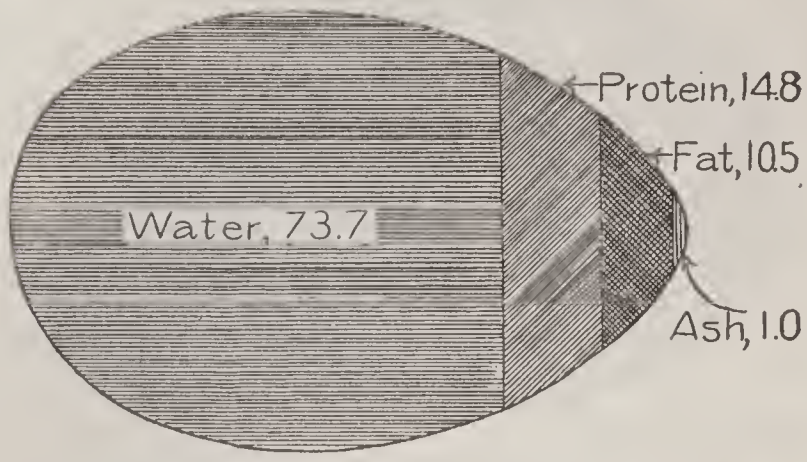
(5) Near the surface of the yolk on one side, and plainly visible in an egg which has not been brooded, is a circular white patch—

the all-important *vesicle,* or *germ,* from which the young bird is developed by incubation.

Hatching. The embryo can be developed only in one way, and that is by the application of heat. Occasionally, in the case of domestic fowls, this heat is artificially furnished, by some sort of an incubator (which see); but in nature the heat is supplied by the body of the female as it sits on the nest. In some species of birds the male sits on the eggs during the hatching period. A temperature of about 104° is needed to develop the eggs of fowls and most other birds, but there is a difference in the time required for hatching. Some small birds brood their eggs only about a week, but it takes three weeks to hatch the eggs of the hen, while those of the goose and turkey need four weeks of incubation.

Number and Size of Birds' Eggs. A full "set" or "clutch" consists of from one to twenty eggs, the number in a set being about the same for each species of birds. Among different species, however, the number varies greatly. The largest families are found among those whose young come into the world with a covering of down, and are able to run about as soon as they are hatched. Such birds require comparatively little care, and a numerous brood does not overtax the parents. The largest numbers are laid by members of the grouse, quail and duck families, represented by the teal, whose set comprises fifteen eggs; and by the partridge, which lays from twelve to twenty. The size of the parent bird, however, is also a determining factor, small birds never laying more eggs than their bodies will cover. But four young, for example, are hatched by the snipe and plover, though their little ones are not wholly dependent on the older birds. The number of eggs laid in a season is sometimes affected by accidental causes. For instance, when a nest is robbed the birds will often replace the stolen eggs. There is on record the case of a flicker, which laid seventy-one eggs in seventy-three days.

Generally speaking, the size of an egg is governed by the size of the bird which lays it; the ostrich, largest of all birds, lays an egg about six inches long, weighing nearly three pounds. From this size eggs of birds range down to the egg of the tiny humming bird. However, eggs of birds whose young are able to care for themselves are relatively larger than those of birds whose offspring emerge from the shell in a helpless, immature condition, for the former must remain in the protective shell a longer time than the less developed birds, and they must have sufficient room in which to grow. For this reason the spotted sandpiper, though about the size of the robin, lays an egg considerably larger than the robin's; likewise the meadow lark lays a much smaller egg than the upland plover, though the birds are practically equal in size.



COMPOSITION OF A HEN'S EGG

The above percentages include the contents of the entire egg. The illustration next following gives the analysis of white and yolk separately.

Eggs as Food

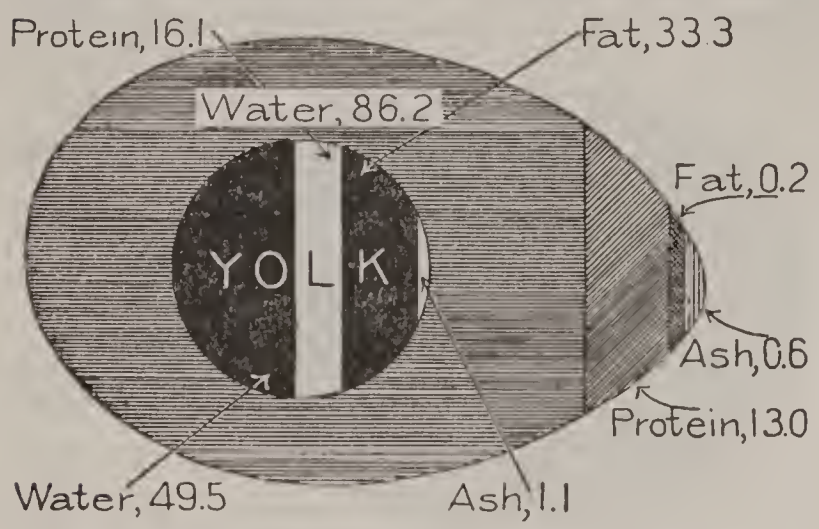
All over the world people use eggs as food, the eggs of fishes and reptiles furnishing not only delicacies but staples in some localities; but it is the eggs of birds, and especially of the domestic fowl, to which most importance attaches.

Food Value. An egg is almost as perfect a food as milk, but it lacks one valuable element which milk possesses, for it has practically no carbohydrates (which see). If served with something which supplies this lack, however, as rice, white bread or potatoes, eggs constitute an ideal food. They are easily and thoroughly digested, too, by nearly everybody.

As regards its constituent parts, an egg, freed from its shell, consists of 73.7 per cent water, 14.8 per cent protein, 10.5 per cent fat and about one per cent ash, and has a fuel value per pound of 720 calories (see CALORIE; FOOD, subhead *Chemistry of Food*). Comparatively speaking, the yolk has far more of the nutrient elements than has the white, the latter being 86.2 per cent water, 13 per cent protein, 0.2 per cent fat and 0.6 per cent ash, and having a fuel value of 250 calories to the pound, while the yolk is 49.5 per cent water,

16.1 per cent protein, 33.3 per cent fat and 1.1 per cent ash, and has a fuel value per pound of 1,705 calories. These figures are for hens' eggs, but the eggs of other poultry do not differ greatly.

Cooking Eggs. Eggs, it is estimated, form about two per cent of the food of the average Canadian or American family, and the methods of serving them, either alone or in



COMPOSITION OF WHITE AND YOLK
For analysis of entire egg, see preceding diagram.

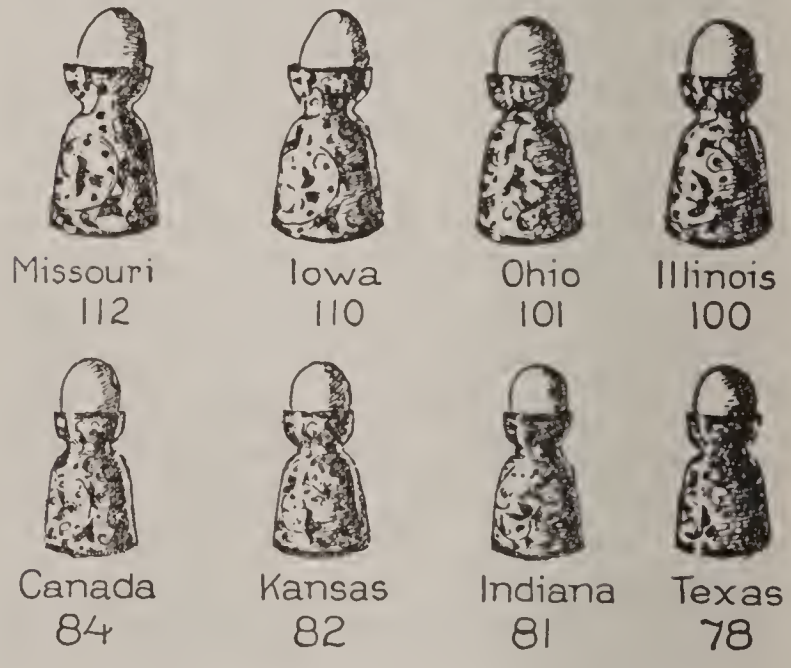
combination, are almost unlimited. Since they are a concentrated animal food, they are best served as a substitute for meat, not eaten with meat. It is impossible to give here specific directions for cooking eggs in all the various ways, but a few general principles may be stated. When eggs are "boiled," perhaps the commonest way of serving them, they are most palatable and most easily digested if they are not really boiled at all, but cooked in water below the boiling point. The white begins to coagulate or "set" at about 134° F., and at 160° is of a jellylike consistency—a "soft-boiled" egg in its best form. If allowed to remain long enough in water at this or a slightly higher temperature, the egg becomes "hard-boiled," but while it is firm it is tender as well, and has not the almost horny consistency of an egg cooked in boiling water.

Since cooked milk is also at its best if kept always below the boiling point, it is obvious that custards or other substances in which eggs are used to thicken milk should not be allowed to boil. If, however, cornstarch is used in addition, it must be boiled, but this can usually be done before the eggs are added.

How to Tell a Fresh Egg. Eggs but a day or two from the nest are far better flavored than those which have been held for a time, even if these latter are still in perfectly good condition. Of the two most popular methods used for testing eggs, one makes no attempt to distinguish degrees of age, but contents itself with showing whether an egg shows signs of being addled or of starting to hatch. The other, within limits, shows whether an egg is fresh or simply well preserved.

The first method is known as *candling*. An egg, held in some device, as a pasteboard cylinder open at the ends, which shuts off the light from the sides, is held against a rather bright light. If it shows clear, it is fresh; if dark and clouded, it is addled; if a well-marked dark spot appears, the germ has begun to develop. In either of the two latter cases the egg is unfit for use.

For the *brine* method of testing, a salt solution made by adding two ounces of salt for each pint of water forms the basis. The eggs are placed in this brine, and those which sink immediately to the bottom are proved to be perfectly fresh—not more than one day old. But because evaporation lowers the density of eggs, an egg three days old will not sink to the bottom, but will be entirely submerged just below the surface of the water, while one

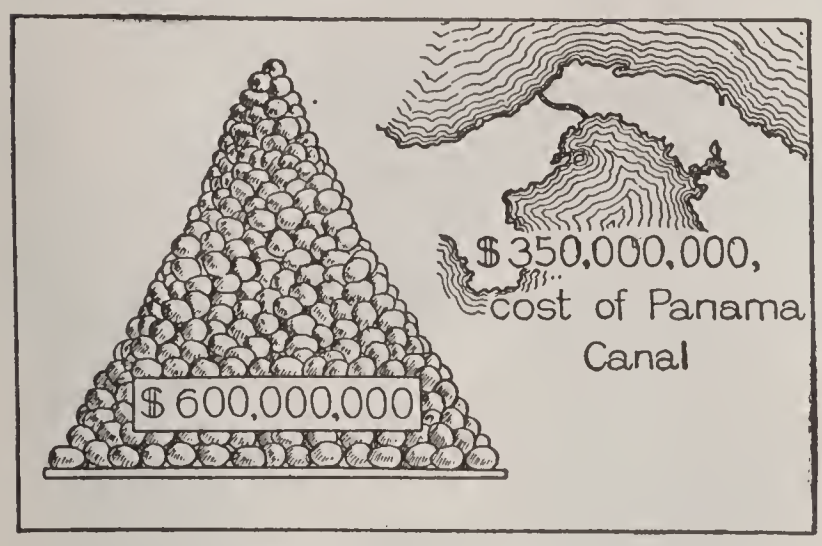


EGG PRODUCTION IN A YEAR
The statistics illustrated represent an average covering five years, ending with 1916.

more than three days old will float on top, the proportion of it which appears above the water being in proportion to its age.

Of course no such test can be looked upon as absolutely accurate, but both of these are satisfactory enough to be of the greatest importance commercially. Indeed, anything which concerns the commercial aspect of eggs is of importance, for it is estimated that there are more than a trillion and a half dozens produced in the United States each year. The

value of the eggs produced every year in the United States alone is about $600,000,000, while Canada produces annually about $25,000,000 worth. Their price varies according as



A STRIKING COMPARISON

The value of the eggs produced in a single year in the United States alone is sufficient to build nearly two canals like that at Panama.

the supply keeps pace with the demand. In periods of scarcity hens' eggs (strictly fresh) sell for as high as seventy-five cents a dozen, and the price ranges from this figure down to twenty cents or less. S.L.A.

EGGLESTON, *eg''lz tun,* Edward (1837-1902), an American novelist, author of *The Hoosier Schoolmaster,* one of the most popular books published in the nineteenth century. He was born at Vevay, Ind., was largely self-educated, as delicate health prevented his going to college, but he was a diligent student and acquired a wide knowledge of French literature, and some Greek. At the age of nineteen he entered the Methodist ministry and for ten years preached, sold Bibles and traveled in Minnesota for his health, and also engaged in such other pursuits as opportunity offered. Later he attracted attention by magazine articles and started his literary career in 1866 by becoming editor of the *Little Chronicle* at Evanston, Ill. In 1867 he removed to Chicago and edited *The National Sunday School Teacher.* Three years later he became literary editor of *The Independent,* New York, resigning that post to become editor of *Hearth and Home.* From 1874 to 1879 he was pastor of the Church of Christian Endeavor in Brooklyn.

In 1880 he retired to his home on Lake George, N. Y., and thereafter devoted himself wholly to literature. At this time Southern Indiana had come into prominence by his story of *The Hoosier Schoolmaster,* which first appeared in 1871 in serial form in *Hearth and Home.* This story was one of the earliest examples of realistic fiction portraying pioneer manners and dialect. Among his other novels are *Hoosier School Boy, End of the World, Mystery of Metropolisville* and *Roxy.* He also published biographies of American Indians for juveniles. The last years of his life were spent in writing a *History of Life in the United States,* but only two volumes were completed at the time of his death.

EGG'PLANT, a tropical vegetable belonging to the same family as the potato. It received its name from the fact that it is egg-shaped. Several varieties are cultivated in many parts of the world for use as table vegetables. In the United States it can be grown successfully as far north as latitude 42°. The purple-fruited varieties are favorites in the United States, the white ones being more popular in Europe. These fruits, from the size of a hen's egg to six or eight inches in diameter, appear on erect vines about two feet high. The leaves of the vine are prickly; the flowers, showy purple. Eggplant is served in several ways.

THE EGGPLANT

Smaller picture shows manner of growth of the plant.

It is best liked when sliced (not always peeled), dipped in a batter and fried in butter. It is as nutritious as cabbage or cauliflower.

A rich, deep, mellow soil is the best for eggplants. The chief difficulty in their cultivation is the start, as they must be raised from the seed in a hothouse or frame. They are not subject to very destructive diseases and they are worthy of more attention than they now receive.

EGLANTINE, *eg'lan teen,* a beautiful wild rose, commonly known as the *sweetbrier.* Its arching brown stems, with their sharp, hooked thorns, are thickly set with small, dark-green leaves and soft-pink blossoms, and leaves as well as flowers have a peculiarly sweet, spicy

scent. The presence of eglantine is thus easily detected, even before it is seen. When the flowers have fallen, bright red or orange fruits appear, larger than those of most roses, and the bush has thus another period of beauty. The sweetbrier has always been a poet's favorite, and references to it are many. Thus Shakespeare says:

> Quite over-canopied with luscious woodbine,
> With sweet musk-roses and with eglantine.

EGRET, *e'gret,* or *eg'ret,* the French word for *heron,* a name given especially to the snowy-white species of heron from which milliners' *aigrettes* have been so inhumanely obtained. Three species are known in America, the tall, handsome *American egret,* the little *white egret,* which has the finest plumage, and the *reddish* egret. All were at one time numerous, especially in Florida, which was their breeding ground. They ranged from Patagonia as far north as Nova Scotia and Oregon. The greed and inhumanity of plume hunters,

THE EGRET AT HOME

American egrets and nesting grounds in the cypress swamps of South Carolina.

however, has nearly exterminated these beautiful birds. Two species are known in Europe, a large and a small one, and in India they are especially abundant. For description and habits, see HERON.

Aigrette, *a gret',* or *a'gret.* Since earliest times small tufts of egret plumage, mounted

PLUMES PREPARED FOR SALE

with jewels, have been worn as marks of honor by personages of rank in Oriental countries. The fashion spread to other countries, until finally aigrettes were worn on military hats and in women's hair and millinery. The demand for these beautiful, graceful ornaments grew so rapidly that the number of egrets has been greatly diminished everywhere. Those much-desired plumes, which grow between the shoulder-blades of the birds and extend to and beyond the tail, appear only in the nesting season. The killing of parent birds for the bridal-plumage therefore means starvation and death of helpless young. Realizing the cruelty and inhumanity of such practice, various countries have adopted protective legislation, thus reducing the number of aigrettes offered for sale and increasing their price. An ounce of egret plumes has brought $54 in the London market.

In India, however, a humane method of obtaining aigrettes has been discovered and adopted, and the aigrette industry has become very profitable there. Egrets are bred in captivity. The plumes, or aigrettes, are plucked just as are those of ostriches, without injury to the bird. When about a week old the young are taken away from the parents and are reared by hand. The parents then breed again, and aigrettes are in that way obtained four times a year. M.S.

EGYPT, the "nursery of the world's art and civilization," is practically the flood plain of the Nile River; for beyond the limits reached by irrigation, the Egypt of geography is an irreclaimable desert. In all the world to-day there is no other country which has had so long an existence as has Egypt. Hundreds, even thousands, of years before the siege of Troy or before Abraham went out from Ur of the Chaldees, it was a settled country with a well-established government and a high culture, its greatness being due very largely to the control of the world's productive copper mines. Ever since the beginning of the Christian Era its history has been one of subjection and at times of oppression, but the people have preserved their identity, and the Egyptian of pure blood to-day has much the same cast of features which is to be seen in the mummy that dates from thousands of years ago.

Egypt includes the lower part of the Nile basin, in the northeast corner of Africa, extending from the Mediterranean Sea on the north to the Nubian Desert region on the south. Its greatest north-to-south length is 675 miles, its average width, about 500 miles, and its area about 400,000 square miles. Thus it more than equals in size Texas and New Mexico together, and is nearly as large as the province of Ontario, but only about 12,000 square miles, comprising the fertile Nile Valley and delta, can be successfully cultivated, and nine-tenths of the people are crowded into this section, which is but little larger than Vermont.

The People. Like most countries of the Orient, Egypt has no accurate census, but its population in 1917 was about 12,751,000. Of these, 10,366,000 are Egyptians, most of them of mixed Arab and negro blood, and fewer than 1,000,000 are Turks or Europeans. The term *Egyptians* includes several more or less distinct classes—the *fellahs* (peasants), Arabs, Copts and Bedouins; while of the foreign element the Greeks and Turks are most numerous, the Italians, British and French ranking next in order. Considering Great Britain's close connection with Egypt, it is rather surprising to find that in the whole country there are only about 21,000 British. The Bedouins are the desert-dwellers, the Arabs live in the towns, but the vast bulk of the population throughout the country districts is composed of the *fellahs,* who must be considered the representative Egyptians.

National Character. In the olden days the Egyptians maintained their kings like any other nation, but the national character was never strong, and one dynasty after another fell before outside conquerors. To-day but the slave class survives in the fellahs—those gentle, docile peasants, whose dominant trait is servile obedience to authority. Good-natured they are and very industrious, but they have no independence, no manly pride, no initiative ability. Their politeness is proverbial—one traveler tells of having inquired of a boy on a winding road whether he was journeying in the right direction to reach a certain town and of having received the answer, delivered in all seriousness, "Yes, your excellency, and had we known you were coming this way we would have had a road made straight for you." But like many exceedingly polite peoples, they are deceitful and cruel. Most of their faults may be traced, however, to the oppression which they have suffered under past government.

Mode of Life. In the towns foreign customs have been introduced and modes of living have changed, but in the peasant villages life goes on much as it has for centuries. There are picturesque features, but little that makes for comfort or pleasure. Except for an occasional religious festival there is no recreation,

and even the little children work from daylight till dark. A typical village, unless quite modern, has walls about it of sundried mud, broken only by the heavy wooden doors in which each street ends and which are closed at night. The one-story huts are also of mud and are built close together, with their flat roofs continuous, so that the goats, sheep and half-wild dogs may roam about over them at will.

Few of the huts have windows, the little door serving for ventilation, and since the streets are very narrow and the fires very smoky, the Egyptian peasants have little pure air to breathe in their homes. Since they are out in the fields most of the day, however, and make use of their homes only at eating or sleeping time, they seem fairly healthy. Rice is the chief food, and coffee, which the poorest family knows how to make excellently, is the well-nigh universal drink. Each village has its guest-chamber in which the chance traveler is fed and lodged, but this is often so dirty that the traveler prefers to do without food and rest rather than to endure it.

Religion. The Copts still hold to their ancient Christianity, and a few people in the towns have embraced that religion, but the great mass of the people is Mohammedan. Their religion is not a surface affair merely, but forms and regulates their lives. God, or Allah, is their personal deity, to whom they can appeal as a father, and the fatalistic doctrine which is so large a part of Mohammedanism prevents them from grumbling at any misfortunes which may befall them. A very strong influence is exerted by religion upon hygiene, for since a Mohammedan may not pray unwashed, ablutions are much more common than they would otherwise be. To men, the religious duties and observances are all-important, but not so to the women. The latter are not allowed to enter the mosques during prayer, and though they are permitted to pray in their homes it is not required of them. Polygamy is legal, but most Egyptians content themselves with one wife. If, however, a wife angers her husband or bears him no children, he may take a second wife or may divorce her by merely saying, "Thou art divorced."

Education. As their religion seems to take it for granted that a woman has no soul, so the educational scheme assumes that she has no mind. Naturally such an attitude works untold injury to the country. A woman is not even taught how to care for her children. If a baby be born to her while she is working in the fields she wraps it in a handkerchief and lays it under a bush in the shade. Later, perhaps, she returns to find that the shadows have shifted, and that the hot sun has killed her baby, but she only says, "It is Allah's will," and returns to her work. As a result of such gross ignorance, it is estimated that about ninety per cent of the babies born to the purely-native population die in infancy.

The men among the peasants are but little better educated than the women, few of them knowing how to read and write. So general is illiteracy that a written signature to a document is exceedingly rare. Where there are native schools they merely teach by rote portions of the *Koran.* In the towns, however, education is farther advanced, and the old conservative method of teaching from the Koran is gradually giving place to something like a liberal system.

The Geography of Egypt. Geographically Egypt has two regions—*Lower Egypt,* which stretches from the Mediterranean to Cairo and consists largely of the Nile delta; and *Upper Egypt,* from Cairo to the southern boundary, a fertile valley nowhere more than fifteen miles broad. These two divisions constitute the part of Egypt which is known as "the gift of the Nile," for only as that river furnishes its waters and the fine silt which remains after its annual overflows has any agricultural development been possible. It is in these two regions that the greater part of the population lives, for only a very precarious living is to be obtained elsewhere. See NILE.

West of the Nile are the barren, rainless stretches of the Libyan Desert. This, in the main, is a region of wind-blown rock waste, but here and there are areas which are watered from subterranean sources or by canals leading to them from the Nile. These are the famous oases, the rich, fertile spots which have an added interest because of their situation as verdant islands in a vast sea of rock waste. East of the Nile is another desert region, but it is mountainous, rising gradually until near the borders of the Red Sea it attains a height of several thousand feet. In the high places there is a little vegetation, and there the Bedouins pasture their wandering flocks.

A discussion of the waters of Egypt can deal with but one topic—the Nile. Since that, with its influence on the country, is given full treatment in the article under its own name,

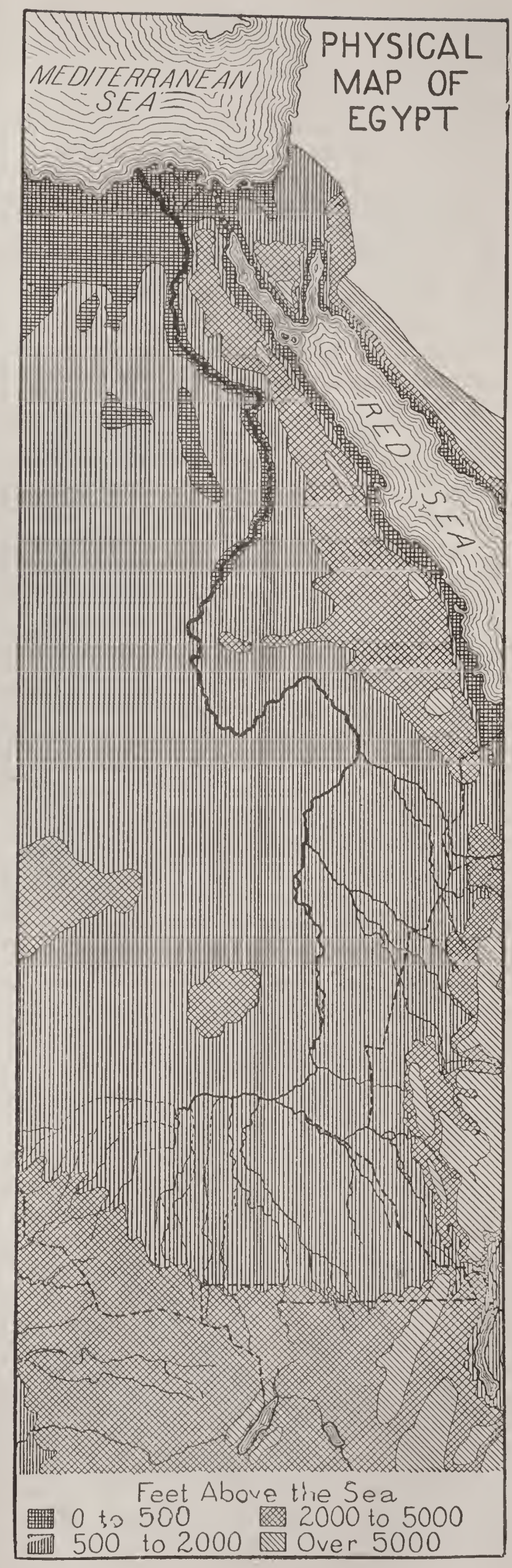
it will not be discussed here. There is probably nowhere else in the world an instance of such utter dependence of a country on a waterway.

Agriculture. Among the delights of Egypt are its sunny skies and its dry air, but for these the country has to pay heavily, for the rainfall is so light that without irrigation agriculture is impossible. And yet, notwithstanding this drawback, Egypt is primarily an agricultural country, and two-thirds of the working people are engaged in tilling the soil, for irrigation is widespread. In Lower Egypt there is an extensive network of canals, many of them navigable, and from these water is led out over the fields until a great area is transformed into a vast garden. Since there is no cold weather, three crops a year are raised in this northern section, wheat, beans, barley and clover being produced in the winter; cotton, sugar cane, millet, rice and fruit in the summer; and maize and millet in the flood season. Particularly valuable among these Lower Egypt crops is the long-staple cotton, used in making thread and hosiery. About one-tenth as much is produced as in the United States, but efforts are being made by the English to extend its cultivation to Upper Egypt.

This latter region was for years dependent upon irrigation of the most primitive sort. During the flood season the water was collected in big mud basins, and after the Nile waters subsided it was let out upon the fields. Too often, however, it did not last through the dry season, and parched crops were the result. With a view to remedying this condition a barrage was constructed at Assiut, and a great dam known as the Assuan Dam was erected near Assuan in 1902; in 1912 this was considerably enlarged, so now the stored-up waters reach the tremendous volume of nine million cubic feet, and large new areas are made cultivable. Upper Egypt raises chiefly grain, vegetables and fruit, but the cotton culture is increasing in importance.

Throughout Egypt most of the land is rented by those who work it, and the former exorbitant rental rates have been lowered during the British protectorate. Methods of agriculture are most primitive, but the fertility of the soil makes up for this, little more than a scratching with the old wooden plows being necessary to secure good crops.

Other Industries. The only manufacture of any importance in Egypt is the making of



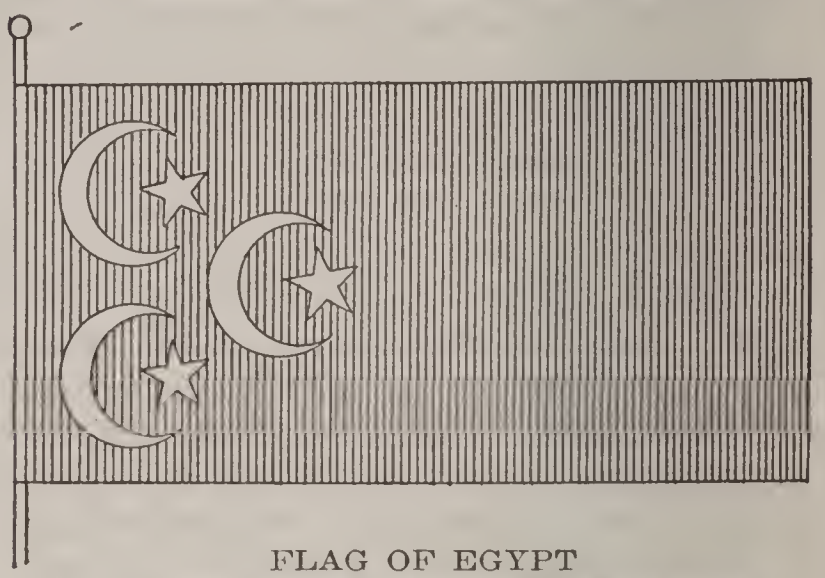
cigarettes from Turkish tobacco. To protect this industry a heavy export tax is levied on native tobacco, which is inferior in quality. Mehemet Ali granted various monopolies and encouraged the founding of a number of industries under the control of the state, but since his time these have all been closed.

In its mineral resources, too, Egypt is very limited, though gold-mining is carried on to some extent in the eastern mountains, and oil wells have been sunk on the eastern coast. That there was once an enormous quantity of stone available is evident from the great buildings and monuments left by the ancients, but at present the output of the quarries is not large. Other mineral resources there may be, but the drifting rock waste has covered them deep.

Commerce and Transportation. Before Great Britain assumed control the commerce of Egypt was very small, but to-day it has a very considerable foreign trade, chiefly with Great Britain. Practically the only things which Egypt itself has to export are cotton, grains and cigarettes, but from its great port of Alexandria are shipped also the ivory and the ostrich plumes which are brought by caravan from the interior of the continent. The United States imports much Egyptian cotton, 100,000,000 pounds a year being no unusual amount. Egypt's imports consist largely of manufactured goods—textiles and metal articles, wood, coal and metals. The internal trade is largely carried on by Arabs and native Egyptians, but Europeans manage the foreign commerce.

The Nile, indispensable for other purposes, is also valuable as a waterway, for it is navigable to the first cataract, just north of the southern boundary. The state owns and operates over 2,300 miles of railway and in addition there are about 725 miles of so-called agricultural roads owned by private corporations. These connect the agricultural regions with the main lines of railway and provide transportation for the produce of the country.

Government. For centuries Egypt has been tributary to Turkey in theory, but during the nineteenth century the native ruler was practically absolute. True, he had a Turkish commissioner in his council and he had to pay a large annual tribute, but his office was hereditary and no one questioned his acts so long as he did not attempt to extend his power beyond Egypt. During the latter part of the century England became so involved in the financial affairs of Egypt that a British representative was sent to take charge of the revenue (see subtitle *History,* below), and gradually the hold of Great Britain on the country was strengthened until Egypt became practically a British dependency. Theoretically the khedive is still the head of the government and rules with the aid of a legislative body of eighty-nine members, three-fourths of whom are elected by the people. There is also a council of six ministers who preside over



FLAG OF EGYPT
White crescents and stars on red background.

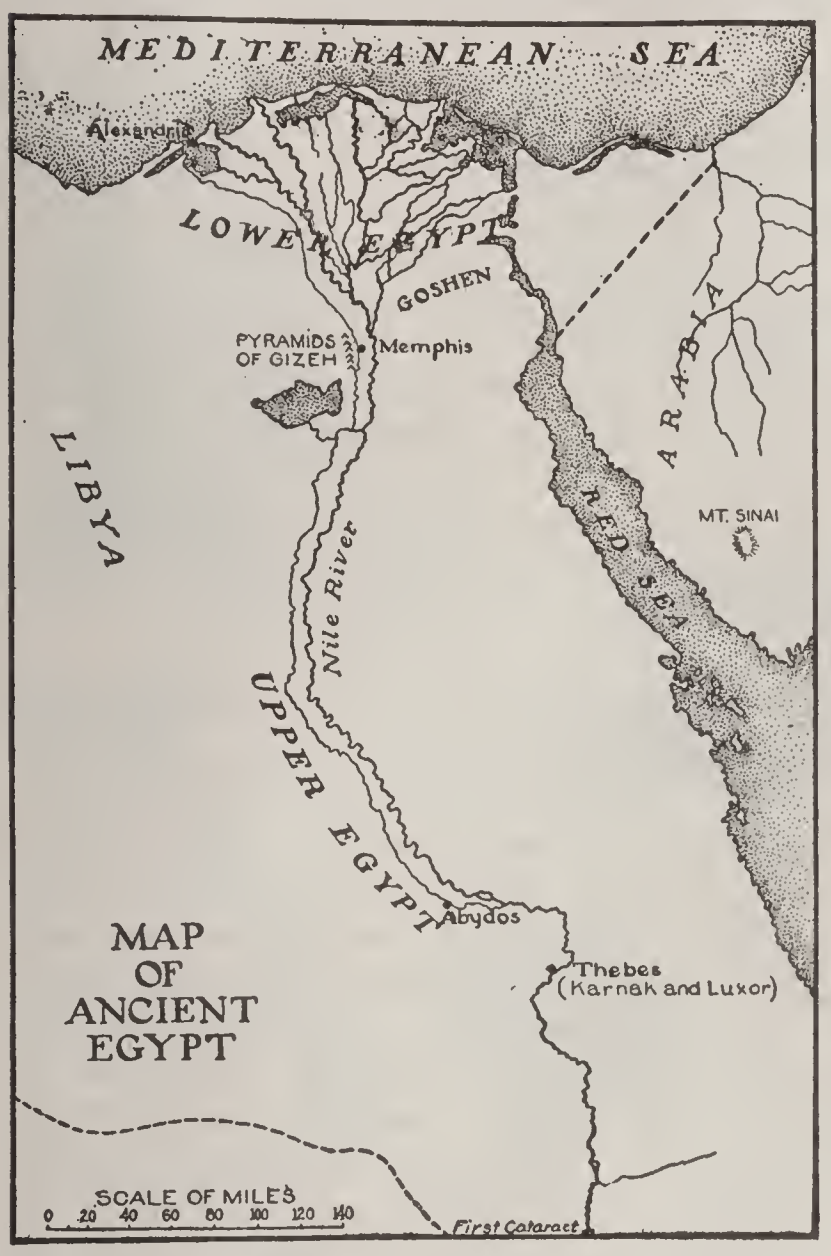
departments of the interior, finance, war, marine, justice and public works and instruction. Several of the ministers, and those the most important, are Europeans. Travelers in Egypt declare that since Great Britain assumed control Egypt has been one of the best-administered countries in the world because usually the best possible man has been placed in each office, without political consideration.

The cities of chief importance are Cairo, the capital; Alexandria, the principal seaport; Rosetta and Damietta, at the mouths of the Nile; and Suez and Port Said at the terminals of the Suez Canal. The most important towns are described in alphabetical order in these volumes.

Ancient Egypt. This is the phase in the life of the country which is most likely to come to mind when the name Egypt is spoken, and indeed the history of the world presents few greater marvels than the high civilization which this Nile Valley region developed so many thousand years ago. What sort of people were dwelling in Europe in those olden days and on what low plane of existence they were living, no one can even conjecture, but in Egypt innumerable relics tell the story of that ancient time, even revealing much of its every-day methods of life.

Learning. First of all, the Egyptians had a system of writing, called the hieroglyphic. It

did not have an alphabet, but conveyed information by means of pictures, which seem to have answered very well all their purposes. A literature existed which had its beginnings very early, and consisted not only of inscriptions on tombs and monuments, but of real



papyrus books as well. To decipher this old writing was a very difficult task for modern scholars, and only after the discovery of the Rosetta Stone was it satisfactorily accomplished. The ancient Egyptians seem to have been very fond of stories, and manuscripts are found of tales which bear a curious resemblance to many of the tales of magic which date from medieval or modern times. For instance, the prince who is shut up in a castle by his father to escape some horrible fate which had been prophesied is a familiar figure in those old Egyptian stories who has corresponding characters in more than one modern tale.

Astronomy, and its older phase, astrology, were known to the Egyptians, and they had a considerable knowledge of arithmetic. They used the bellows and the blowpipe, the lever, the balance and the siphon, and they knew how to obtain the fiber from flax and spin it into cloth.

Art. Certain branches of art the Egyptians had evolved to a high degree of excellence. Their buildings were for the most part not specially graceful or beautiful, but they were massive and imposing, while their sculptures, if showing no knowledge of perspective and lacking ease and naturalness, convey the ideas of strength and of vigorous action. Beautiful, glazed pottery, filigree and inlay work of rare design, have also been found in their old tombs and temples, and specimens of skilfully enameled jewelry are numerous.

Religion. The dominating religious tendency was a belief in the immortality of the soul, and the conviction that some day it would return to the body, which must be preserved in readiness to receive it. It was this belief which led the ancient Egyptians to embalm their dead so carefully that many of the bodies have been preserved in an excellent state until the present time, and to erect such vast burial places as the Pyramids. In the MYTHOLOGY index may be found a subhead treating of Egyptian mythology, while in the article TRANSMIGRATION OF THE SOUL is a discussion of the curious belief which resulted in the setting aside of a number of animals as sacred.

History of Egypt

Just how old was the civilization of this most ancient of countries cannot be known, but it is certain that Egypt was a flourishing nation long before 3000 B. C. The monuments and inscriptions tell much concerning the ancient period, but leave much in doubt as to chronology. Thirty dynasties of kings, according to the old historian Manetho, ruled in succession; some were comparatively insignificant, some very powerful and determined to leave their impress on the people. The Fourth Dynasty, for instance, which was at its height about 2800 B. C., left as its memorials the greatest of the Pyramids. From 1700 to 1600 B. C., or thereabouts, the country was under the sway of foreign sovereigns who ruled by conquest—the Hyksos, or Shepherd Kings; and after they were driven out there came a wonderful period when the Theban kings reveled in the building of magnificent palaces and temples, the ruins of which still exist at Thebes.

Seti I and Rameses II (see articles under

these names) were the outstanding kings of the famous Nineteenth Dynasty, the latter reigning about 1330 B. C. Until recently it has been believed that Rameses II was the king who "knew not Joseph" and who oppressed the Israelites, and that the Exodus occurred under his son Mernephtah, but inscriptions lately deciphered have proved that this is impossible. With the Twentieth Dynasty came a weakening of power, and gradually Egypt passed under the sway of outside countries. First Assyria (670 B. C.), then Persia (525 B. C.), then Greece, had its will with the country, Alexander the Great being received as a veritable deliverer because the people had suffered so severely under Persian rule.

Egypt under the Greeks and Romans. Until his death Alexander was lord of Egypt, and then one of his generals, Ptolemy, was made king. Alexander's new city, Alexandria, was made the capital, and the new Greek state acquired practical independence and a foremost place among the countries of the world. Never before had Egypt been so prosperous, for the first Ptolemy was a strong and wise sovereign, and some of his descendants were not unworthy of him. Commerce flourished, the people had enough to eat, and Alexandria became the center of the intellectual and literary life of the world. In the second century B. C., a period of decline set in, and the later rulers of the Ptolemaic dynasty were forced to ask aid of Rome in their external and internal troubles. The last sovereign, Cleopatra (which see), maintained her independence only because her beauty brought her the favor of the Roman rulers, and after her death the country became a province of Rome. Under the empire there were few disturbances in Egypt, and the most interesting event was the spread of Christianity among the people. In the later divided condition of the Roman Empire, Egypt was neglected, and in 641 was conquered by the Saracens with little opposition.

Under Mohammedan Rule. This African province was a very important Mohammedan possession, and Cairo was a center of Moslem life. The Crusaders made Egypt one of their points of attack but accomplished nothing lasting, and from the thirteenth to the sixteenth century the country was sinking constantly lower into anarchy and wretchedness. The Mameluke chieftains were conquered by the Turks in 1517, but their real power was not broken, and it was the Mamelukes whom Napoleon encountered on his invasion in 1798. He gained control of the country, but in 1801 was driven out by the Turks, with the aid of the British.

Nineteenth Century Egypt. After the expulsion of the French, a Turkish soldier, Mehemet Ali, was made pasha, and as he was a man of great ability his long rule was one of progress. He succeeded in making the country practically independent, though he was forced to acknowledge the nominal authority of Turkey, and he extended Egyptian territory materially and improved agriculture. His reign was a hard one on the people, however, for he laid upon them terrible burdens of taxation. Under the rule of his successors, Abbas Pasha and Said Pasha, the taxes were lessened and the country was placed upon a firmer footing financially. It was during the reign of Said that the Suez Canal was begun.

Ismail Pasha, a grandson of Mehemet Ali, became the head of the government in 1863, and four years later took the title of khedive, which in Persian means *prince*. His administration was vigorous but exceedingly extravagant, and the finances of the country were brought by him into the utmost disorder. Forced by financial necessity to sell his stock in the Suez Canal to Great Britain, thereby giving the British a majority of the shares, he thus gave that country its first hold on Egypt, and in 1876 was compelled to allow European commissioners to take control of the revenue. In 1879 the French and British governments obliged him to abdicate in favor of his son Tewfik, and in the next year a joint French and English control over the country was established. The so-called national party revolted in 1882, and forced the khedive to flee, but a British fleet bombarded the city on July 11, and restored him. Since the dual control system seemed to lead to endless difficulties, the arrangement was modified so that the country became practically a protectorate of Great Britain, though the khedive remained the nominal head.

The next event of outstanding importance was the rebellion in 1884 of the Mahdi, and Gordon's expedition into the Sudan with its tragic outcome. After that the Sudan remained quiet for more than a decade, but in 1894 another insurrection occurred, which the new Egyptian army under Kitchener put down in a series of campaigns ending in 1898. Tewfik died in 1892, after a long and wise rule, and his son Abbas Hilmi succeeded. This able

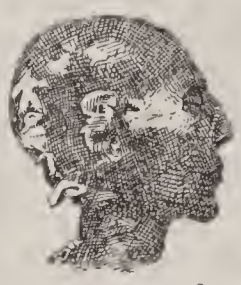
EGYPT

The Vocal Memnon

On the Banks of the Nile Today

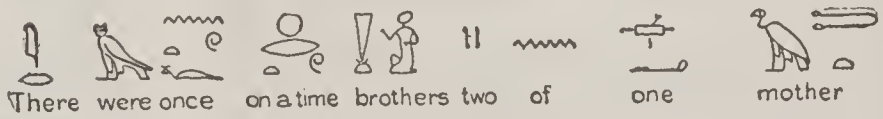
Colossus of RamesesII, at Luxor

Temple at Philae, below Assuan



Mummy of Seti I

Standing in Majesty through 5000 Years



Ancient Egyptian Writing, with Translation

Hall of Columns at Karnak

Cartouche of Khufu

A Queen of Old Egypt

Gateway at Karnak

Outline and Questions on Egypt

Outline

I. Location and Size

(1) Latitude and longitude
(2) Boundaries
(3) Greatest length and breadth
(4) Actual area
(5) Comparative area

II. Physical Features

(1) Lower Egypt
(2) Upper Egypt
(3) Desert regions
(4) The all-important Nile

III. Industries

(1) The chief industry—agriculture
  (a) Where carried on
  (b) Products
  (c) Irrigation
(2) Manufacturing
(3) Mining

IV. Transportation and Commerce

(1) The Nile as a waterway
(2) Railroads
(3) Roads
(4) Growth in commerce

V. The People

(1) Characteristics
(2) Mode of life
(3) Education
(4) Religion
(5) Different races

VI. History and Government

(1) Ancient Egypt
(2) Foreign domination
(3) Effect of War of the Nations
(4) Government
  (a) Part taken by Great Britain

Questions

How large a percentage of the babies of the natives live past their infancy?

How carefully must land in the irrigated districts be cultivated in order to yield?

What justice is there in calling Egypt the "nursery of the world's civilization"?

What is taught in the native schools of this country?

Of what important principle of art did the ancient Egyptians show no knowledge?

What gave Great Britain its first hold on Egypt?

What effect does an Egyptian's religion have on his cleanliness?

Tell the interesting story of the decipherment of ancient Egyptian writing by means of the Rosetta Stone.

Describe a typical native village.

Who was the most famous ruler Egypt ever had?

What has the national character had to do with the political history of Egypt?

Why is the country called "the gift of the Nile"?

To how many countries has Egypt belonged?

Who are the *fellahs?* How large a part of the population consists of them?

Who were the Shepherd kings?

What part did Kitchener play in the history of Egypt?

What religious belief did the embalming of the dead grow out of?

Who was "Chinese Gordon"? What did he have to do with Egypt?

and progressive ruler did much for the country, seconding every suggestion which Great Britain made for its improvement, and under the highly capable guidance of Lord Cromer, Egypt has been practically remade economically.

Recent Events. The nationalists have not been satisfied. They have struggled constantly for independence, one of their measures having been the presentation, in 1906, of a monster petition to the visiting Prince of Wales, begging for the removal of Great Britain's control. An Egyptian prime minister was assassinated, outbreaks occurred in all the large towns, and in 1912 a plot for the assassination of Kitchener, the viceroy, was discovered. By his well worked-out constitutional reforms, however, Kitchener did much to quiet the disorder.

In 1914, after the outbreak of the War of the Nations, Egypt was put in a state of war under protection of Great Britain, and, in the main, feeling in the country remained loyal to the British rule. A formal declaration that "Egypt is placed under the protection of his Britannic Majesty" and that "the suzerainty of Turkey is thus terminated" was issued on December 17, 1914, and on the following day Abbas Hilmi was deposed, his uncle, Hussein Kâmil, succeeding him with the title of sultan of Egypt. The Germanic powers, with the help of their ally, Turkey, attacked Suez in 1915, with the hope of destroying the canal and invading Egypt. Each attempt failed. In 1921 practical independence was granted, Britain keeping a hand on foreign affairs. J.R.

Consult Low's *Egypt in Transition;* White's *The Expansion of Egypt;* Todd and Du Cane's *The Banks of the Nile.*

Related Subjects. The reader who is interested in Egypt will find much that is helpful in the following articles in these volumes:

CITIES AND TOWNS

Aboukir
Abydos
Alexandria
Assuan
Cairo
Fashoda
Heliopolis
Khartum
Memphis
Port Said
Siut
Suez
Thebes

HISTORY

Cleopatra
Gordon, Charles George
Hyksos
Khedive
Kitchener, Horatio
Mamelukes
Pharaoh
Pharos
Pyramids

LEADING PRODUCTS

Cigarette
Cotton
Rice
Wheat

UNCLASSIFIED

Architecture
Astrology
Cape-to-Cairo Railway
Hieroglyphics
Mummy
Nile
Nomad Life
Papyrus
Philae
Rosetta Stone
Scarab
Sculpture
Sphinx
Suez Canal

EIDER, *i'der,* **DUCK,** a duck of the sea from whose breast is obtained the soft, warm down used in coverlets and pillows, especially in European countries. It is larger than a common duck, but not as large as a goose. Two species are known to sportsmen in America, from the coasts of Newfoundland and Labrador southward to New England and west to the Great Lakes.

THE EIDER DUCK

The best known and most important eider, however, is the European species. The male is mostly black, with back and head creamy-white. The female is reddish-drab, streaked with brown and black. Differing from the American species, the male has a green instead of black patch on the crown. Eiders frequent solitary rocky shores and islands and feed on fish, for which they dive.

Eider-down. The soft, mouse-gray down of commerce is obtained chiefly from Iceland, although Norway and Greenland have valuable *eider-folds.* Down found in the grass and seaweed nests of eider ducks is the most valuable, and is called *live* down, for it has been plucked chiefly by the female from her own breast to soften her nest and protect her eggs and young. Down taken from dead birds is called *dead* down. About one-half pound of eider-down is taken from one nest each year. Five pounds of the best quality are enough for a bed. Two or three pounds of down, however, can be put under pressure and reduced to a ball the size of a man's fist.

EIFFEL, *ef el',* **TOWER,** a colossal steel skeleton structure on the Champ de Mars, Paris, erected for the exposition of 1889, and named after its projector, Gustave Eiffel. A marvel of engineering design and execution, it still stands as one of the interesting and ornamental features of Paris. It is 984 feet high and 330 feet square at the base, and is constructed of iron lattice-work, elevators and stairways giving access to its platforms or galleries. The latter are occupied by restaurants, physical and biological laboratories, and by the experimental station of the French Weather Bureau. The tower contains 7,300 tons of iron and steel, and cost over $1,000,000, about thirty per cent of which was voted by the government and the remainder supplied by M. Eiffel, who was to be reimbursed for his advance from the profits derived from admission fees to the tower for a period of twenty years. The receipts for the year 1889 alone practically covered the cost of construction. The great height of the structure, exceeding that of any other in the world, made it an important military observation station during the War of the Nations, which began in 1914. Repeatedly the Germans attempted its destruction by hurling bombs from airships.

EIFFEL TOWER

Alexandre Gustave Eiffel (1832-), famous as the designer of the Eiffel tower, first achieved prominence by his employment for the first time of the compressed air method of sinking foundation cylinders in bridge construction. He engaged in many other important engineering activities, among them being the construction of great bridges, the building of the iron frame work of Bartholdi's Statue of Liberty in New York harbor, and the designing of the gigantic locks of the Panama Canal, when it was under French control. In 1893 he became involved in the Panama Canal scandal, and was convicted of misappropriating the funds of the Canal Company; for this he was sentenced to be fined and imprisoned, but the sentence was annulled. He thereafter devoted his time to the study of air resistance, and in 1913 published a book that was of great value to aeronautical engineers.

EIGHT-HOUR DAY, a term which relates to eight hours of work a day. The effort to limit the working day to eight hours is chiefly the outgrowth of two causes, the development of the factory system of industry and the rise of labor organizations. The arguments in favor

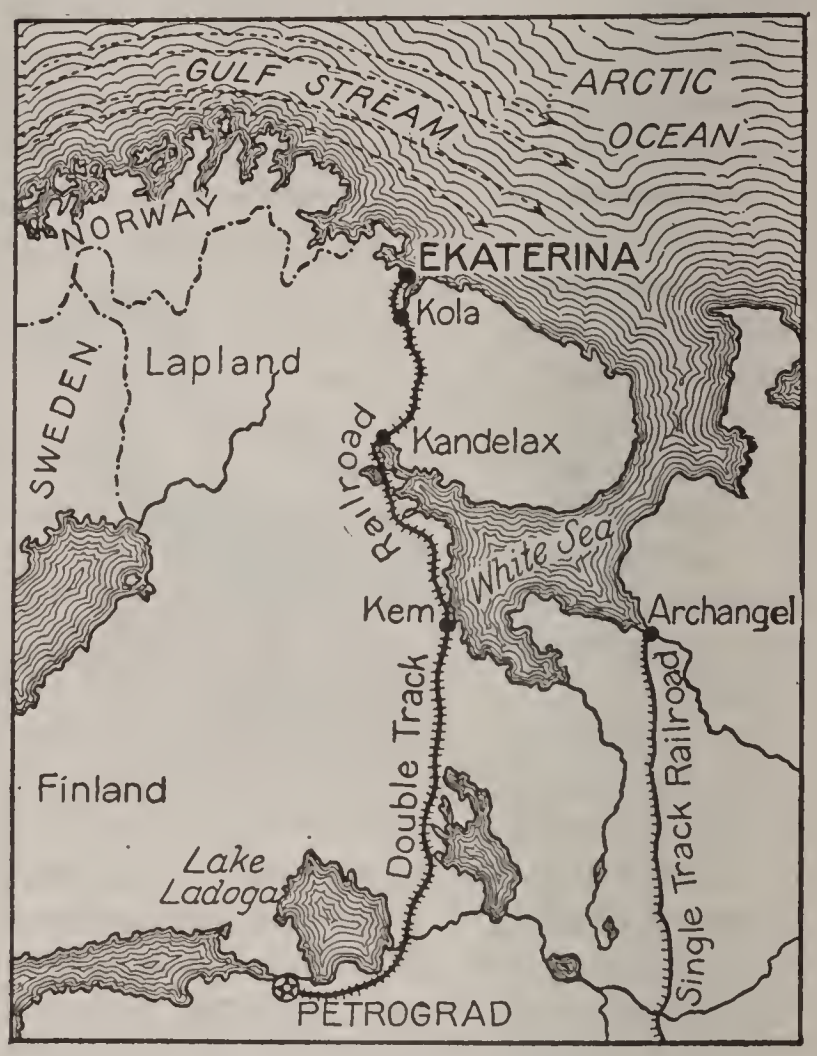
of it are obvious; the person who works more than eight hours becomes more or less exhausted, physically and mentally, turns out poor work, and eventually loses his health. The only serious objection to the eight-hour day is advanced by some employers who maintain that it reduces profits to the vanishing point. While this may be true in rare cases, it has been scientifically determined that the average workman, under good working conditions, will turn out week after week as large a product in eight hours daily as he will in nine or even ten hours.

In a few industries nine-, ten- and twelve-hour days are still the rule, but nearly all skilled laborers now work only eight hours. In the building trades, in coal-mining and in the printing trades, for example, the labor unions have been able to bring sufficient pressure on their employers to obtain the eight-hour day. The movement has also received great support from the Socialists, who have generally adopted the eight-hour day as one of their principles. In the United States and Canada nearly all work for the national or local governments is now done on an eight-hour basis; a law passed by Congress in 1912 provides an eight-hour day on all contracts for work for the Federal government. In Arizona, Colorado, Montana and other mining states, eight hours is the limit for work underground, and in some states for all work in or about mines.

In 1916 the Congress of the United States passed the so-called Adamson law, giving to 400,000 railway trainmen an eight-hour day. The railroad companies protested against the injustice of the law, as it raised wages over twenty per cent without permitting them to increase their income to meet the added outlay. The Adamson law was the greatest victory ever achieved by labor.

In England the eight-hour day has become the rule rather than the exception in all skilled trades, chiefly through the power of the unions. In France and Germany considerable progress has been made, but the leader in the movement is Australia, where some of the labor organizations in Melbourne as early as 1856 secured an eight-hour day. W.F.Z.

EKATERINA, *yeh kat ye re' na,* Petrograd's new commercial port in Russian Lapland, situated on a far northern coast at a point where the warm Gulf Stream mingles with the waters of the Arctic Ocean. The town lies 700 miles north of Petrograd and sixty-six miles east of the Norwegian boundary. It is 600 miles nearer the Atlantic than is the ancient port of Archangel, on the White Sea, and owing to the influence of the Gulf Stream, its harbor is ice-free throughout the year. When the War of the Nations broke out trade channels through the Baltic Sea to the Atlantic were closed, and



THE ICE-FREE PORT

Russia was forced to depend solely on Archangel to obtain supplies and munitions of war from its allies. The harbor of Archangel is ice-bound at least six months of the year, and it is served only by an inadequate, single-track, narrow-gauge railroad.

Ekaterina lies in a region of fir trees, barren rocks and lonely swamps, and for half of the year is shrouded in winter darkness, but over the 700 miles of unbroken country between it and Petrograd the Russians constructed a double-track railroad, which was partly open for traffic in 1922. The new port may entirely supersede Archangel as a trade outlet; it was planned by the empire to use the latter only for the military.

E'LAND, the Dutch name for the largest antelope found in Africa. It is fully six feet in height, as large as a full-grown horse, and weighs 1,000 pounds or more. It was called *elk* by the early settlers in South Africa. The flesh is decidedly palatable, and the hide is used for harness. The slow movements and gentle manner of the animals make their capture an easy matter, and in consequence they are

being exterminated. A larger species is found in Western Africa. For illustration, see page 278.

ELASTICITY, *e las tis' i ti,* a term used in physics to designate that property by which bodies resume their original size and form when the external force by which their size and form have been changed is removed. All substances possess this property in some degree. Elasticity is of two kinds, elasticity of *volume,* which is the property of gases and liquids, and elasticity of *form,* the property of solids. Solids that have little ability to resume their original shape after the action of stress or pressure are said to be *inelastic,* or *plastic.* When a body has reached its elastic limit, further stress or pressure will cause permanent change of form or size. This is illustrated by a rubber band which has been stretched until it will not resume its original size. Elasticity may be developed by pressure, pulling, bending or twisting. Gases are the most elastic substances. Hard solids are more elastic than soft solids. Such substances as lead, putty and dough have very little elasticity. See PHYSICS; MATTER.

EL'BA, an Italian island in the Mediterranean Sea, six miles west of the mainland, historically famous as the enforced residence of Napoleon Bonaparte after his first abdication in 1814. Here he remained, with supreme authority, until 1815, when followed the famous "Hundred Days" in European history, March 20 to June 28, from the date of his entry into Paris to the second abdication. The island is eighteen miles in length and three miles in width, and is mountainous in character. Its principal product is iron, but it is also rich in marble, wines and fruits. The sardine industry gives employment to a part of its inhabitants. It has two well-fortified seaports, as fortifications were understood before the War of the Nations; these are Porto Ferrajo, the capital, and Porto Longone. For governmental purposes it is a part of the Italian province of Leghorn. Its population is about 26,000.

EL'BE, a German river which is one of the most important commercial highways of Central Europe. It rises on the borders of Bohemia and Silesia, at an altitude of 4,000 feet, and after a course of 780 miles empties into the North Sea, at the port of Cuxhaven. Wherever possible the Elbe has been rendered navigable, and towns on its banks have vied with each other in building docks with improved loading, unloading and storage facilities. Dresden, Wittenberg, Magdeburg, Torgau and Hamburg are the most important commercial centers passed in its course, and each city takes the fullest advantage of the cheap transportation and water power it affords.

Steamers and barges navigating the Elbe outnumber those of any other German river.

COURSE OF THE ELBE RIVER

Ocean-going vessels ascend as far as Hamburg, eighty miles from the sea. The fisheries are valuable—sturgeon, shad and salmon being taken in great numbers. Vast quantities of timber are floated down the Elbe from the interior to the sea. A network of canals connects the river with the commercial centers of the surrounding territory, and in this way its advantages have been developed probably more than those of any other river in the world.

ELBERFELD, *el ber felt',* an important commercial town of Germany, forming practically one city with Barmen, although they are municipally separate. It is situated on both banks of the River Wupper, about fifteen miles northeast of Düsseldorf. Elberfeld has long been a noted educational center, and it is only within recent years that it has assumed commercial importance. It is now the center of German cotton, wool, velvet and silk industries, and produces great quantities of chemicals and dyestuffs. Extensive foreign and domestic trade is carried on, and the city has excellent railway communications with interior and coast towns. Elberfeld owes its original industrial growth to Napoleon's continental system (which see), which prohibited all dealings with the British. Population in 1919, 157,218.

ELBURZ, *el boorz',* a chain of mountains in Northern Persia, extending from the western

shore of the Caspian Sea for a distance of 650 miles into Khorasan. The western portion runs almost parallel with the seashore, which at some places is only twelve miles distant. Numerous streams drain the northern slopes, which are covered with forests containing magnificent hardwood trees. The range contains many peaks over 10,000 feet in height, Demavend being the loftiest, with an altitude of 19,400 feet. The nomadic tribes of the surrounding plains take their flocks and herds to the slopes of Elburz in summer, finding there excellent grazing and plentiful supplies of water. See NOMAD LIFE.

EL CANEY, *el kah' na e,* BATTLE OF, a battle of the Spanish-American War, fought in Cuba, four miles northeast of Santiago de Cuba, July 1, 1898, between 4,500 United States troops commanded by General Lawton, and Spaniards, led by General Vara del Rey. The Spanish troops were well entrenched, and although numbering only 500, offered stubborn resistance. The Americans won the day, the casualties on each side numbering more than 400.

EL'DER, a genus of graceful, quick-growing, stout-branched trees and shrubs common along roadsides and fences throughout the United States, Southern Canada and Europe. There are about twenty species, all having opposite

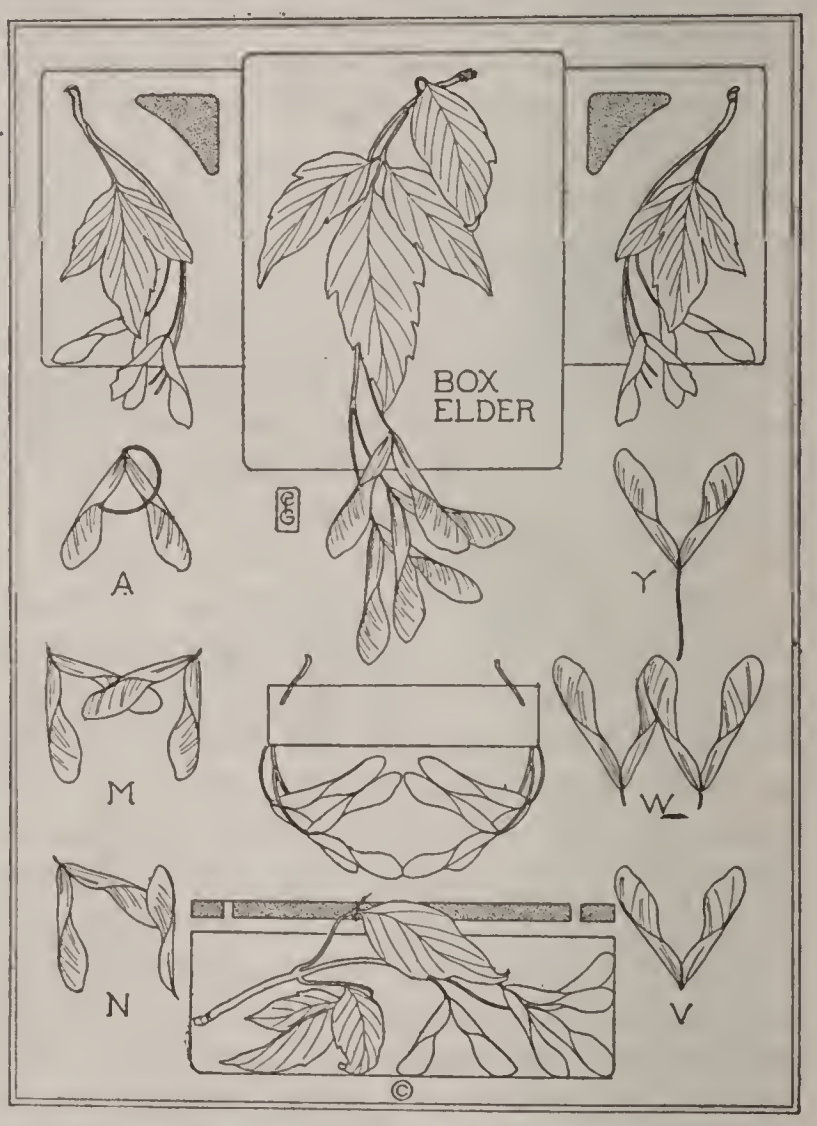
LEAVES AND FLOWERS OF THE ELDER

leaves, usually with finely-cut edges, and large flat-topped clusters of small white flowers. The juicy fruit is either black or red, with from three to five seeds, or nutlets.

Elder shoots, which are full of pith, are used by boys for making whistles and "pop-guns." The Greeks used to make a musical wind instrument, the *sambuke,* from hollow elder stems. Elders are valued chiefly for shade and ornament, although the wood of one European species is tough and hard and takes a good polish.

Uses of Berries and Flowers. Elder berries make excellent pies and wine, and are sometimes eaten off the trees by Indians and Mexicans. Occasional efforts have been made to improve the fruit, and work along those lines has already repaid experimenters. The flowers, too, are used for making wine, and also for a perfume and a "water" used in candies. The dry flowers are employed in medicine for their stimulating and carminative properties.

Box-Elder, or **Ash-Leaved Maple,** is a small but beautiful tree. It grows rapidly almost



SUGGESTIONS FOR BOOKLET

Small designs may serve as initial letters: at the bottom is a tail-piece ornament. The illustration at the top, with the border and central figure, makes an attractive cover design.

anywhere, and it is therefore a favorite shade tree. As windbreaks, or for planting timber claims, these trees are ideal; they also make good nurse trees for other species. The wood is soft and brittle and of little value, but is used for making bowls, pails and wood pulp, and as a fuel.

EL DORADO, *el doh rah' doh,* a Spanish word meaning *the gilded.* It was applied first to the chief priest of a South American tribe who is said to have covered himself with gold dust at a yearly religious festival; next, to a fabled city in South America called Manoa; and, finally, to a mythical country in which gold and precious stones were to be found in abundance.

These legends led to many expeditions among the Spaniards, who unsuccessfully explored for treasure. Sir Walter Raleigh, who took up the search in 1595, described Manoa as a city on Lake Parima, South America, but its existence was later disputed by the geographer Humboldt. The name *El Dorado* is to-day applied figuratively to any locality where wealth can be acquired rapidly.

ELECAMPANE, *el e kam pane',* a sweet herb especially popular in European and Asiatic gardens in the Middle Ages, and still cultivated there and in America. The flowers are compound and of yellow or orange hue. The root leaves are often two feet or more in length, the plant itself growing three or four feet high. As a tonic and stimulant to the organs of secretion, the root with its bitter, camphorlike taste was at one time popular but is seldom used to-day. It is now chiefly employed in the manufacture of absinth in France and Switzerland (see ABSINTH).

ELECTION, *e lek' shun,* the process by which a free government or any organization or society chooses those who are placed in positions of authority. In the selection of all important officials safeguards are placed around election machinery; the usual form by which choice is made is by ballot, and some modification of the Australian ballot reform law has been widely adopted in England, Canada and the United States. The latter country is the only one whose entire voting population participates in any degree in the choice of its chief executive. The voters of each state, by constitutional provision, choose from their number as many electors of the President and Vice-President as the number of Senators and Representatives sent by the state to Congress. Electors so chosen, 531 in number from 1913 to 1923, form the Electoral College. They meet in their respective states and vote by ballot, a majority being necessary to elect.

Elections to state offices are participated in by all legal voters. In some states a legal voter may be a foreigner who has made only his first declaration of intention to become an American citizen. The man or woman in the United States who is qualified under the state constitution to vote for representatives in the state legislature is qualified to vote for electors of the President and Vice-President, members of the United States House of Representatives, and all state, county and township officers. Elections are said to be *direct,* when participated in by the entire voting population; *national,* when the officers chosen serve the entire country; *state,* when confined to choice of those who administer the affairs of the state; *local,* with respect to limited jurisdiction, as in a county or township; *indirect,* or *representative,* as in the choice by all the voters of electors of the President and Vice-President.

Registration. To secure honesty in elections the names of all legal voters are listed in books at the polling places. Registration is required several days before election, in large cities the last registration day being at least two weeks before election day. The requirements vary in different states, since each state makes its own election laws. In general, however, the voter is required to give his name and place of residence, the length of time he has lived in the precinct, county and state, and to tell the country in which he was born and the year of his birth. If a naturalized citizen he may be required to present his naturalization papers. On election day each voter's name is checked on the polling list when he casts his vote. By this means "repeating," or voting more than once, is made difficult. If a man endeavors to impersonate a voter and secure the privilege of voting when he is not entitled to it, watchers stationed at the polls to detect fraud may "challenge" his right to cast a ballot. Faulty methods of identifying voters are giving way to corruption-preventing devices.

Expense. The expense involved in conducting elections, including the essential items of rental of polling places, printing and distribution of ballots and compensation of election clerks, is borne by the general public out of funds raised by taxation.

In Canada. In Canada, although the Governor-General appoints the Premier, that appointee must in advance have secured election to the Dominion Parliament by majority vote of the people of his district. Elections to Parliament and to local offices in the Dominion are participated in by male voters of twenty-one years of age or over; each province determines the qualifications of voters, as in the states of the American Union. In England the Premier is named by the sovereign, but unless the people endorse the acts of his administration by vote when members of the House of Commons are chosen, he must resign. E.D.F.

Related Subjects. The reader is referred to the following topics in these volumes:

Australian Ballot	Electoral College
Ballot	Short Ballot
Citizen	Naturalization

ELEC'TIVE STUDIES, a term that has come into common use in recent years to indicate courses of study in high schools, colleges and universities which may be chosen or *elected* by students. In former times there was a prescribed curriculum that every candidate had to pursue who wished to take a course leading to degrees. But with the development of science during the nineteenth century and the necessity of including in the curriculum new branches of study, it was seen that it would be impossible for a student to take all of them. On the other hand, it came to be recognized that it was not advantageous to compel every student to take all subjects, regardless of his interests, aims, inclinations or capabilities. So at the present time colleges allow considerable freedom in the selection of the branches of learning to which a student may devote his time.

The University of Virginia, under the influence of Thomas Jefferson, was the first to offer to its students some freedom in choice of subjects. This was early in the nineteenth century, and its example was soon followed by Harvard. At that time modern languges were about the only elective subjects students could choose, but to-day the choice is very extensive. The advantage of the elective system is that it gives a student the opportunity to develop along the lines of his special inclination and aptitudes.

In order to avoid the danger of a student electing only "easy" subjects, or scattering too greatly, several methods have been adopted. The method generally followed consists in the arrangement of the courses into groups of subjects, and requiring students to choose a certain amount of work from each of these groups. Each group is made up of closely-related subjects, such as natural sciences in one group, history in another, etc. The arrangement of subjects into groups differs in the principal colleges, but all of them are framed with one end in view, namely, not to leave out from the course of study those subjects which are regarded as essential to a liberal education.

The curriculum adopted to-day in most progressive colleges usually contains the following kinds of courses: (1) prescribed courses that all students *must* take; (2) a certain number of elective studies which the student chooses himself. The number of courses he may elect varies in different schools, but they usually comprise from one-fourth to one-half of his entire course. The student may either choose a wide variety of subjects, or he may specialize still further in the subjects he has already chosen.

ELECTOR, GERMAN IMPERIAL. In the history of the Holy Roman Empire (which see) an elector was a member of the electoral college, consisting of German princes, which chose the king of the Romans. The electors claimed that an election as king of the Romans was equivalent to election as Holy Roman emperor, but the Popes were accustomed to exercise the right of sanctioning the choice of the electors in respect to the greater imperial office. Originally the number of electors was seven, but in 1648 it was increased to eight and in 1692 to nine. The college was first definitely authorized in 1356 by the Golden Bull of Charles V (see GOLDEN BULL). Among the notable electors were Frederick William of Brandenburg, called the Great Elector; his son, Frederick, the first king of Prussia; and Maximilian, Duke of Bavaria, head of the Catholic League in the Thirty Years' War.

ELEC'TORAL COLLEGE, a body of men chosen by the people of the United States every fourth year to elect their President and Vice-President. Its existence is due to disagreements in the Constitutional Convention, in 1787, as to the safest method of choosing the Executive. Only two ways seemed possible—by direct election through votes of all the people, and by election at the hands of a special body of men.

The majority of the Convention refused to accept the second possibility, if it meant that the President should be elected by Congress. It would place too much power in the hands of the legislative department, because if tne President were indebted to Congress for his election and dependent upon the favor of that body for reëlection, the fact might largely influence his public acts.

Alexander Hamilton fought the participation of all the people in the election. Hamilton was an aristocrat and had little faith in the intelligence of the masses: "The people, Sir, the people is a great beast!" he declared to the Convention. Possibly the most valid objection to direct election was that means of ready communication did not exist whereby all the people could acquaint themselves with public men and become proper judges of the candidates' qualifications. But it was believed that the people could select men locally whose good judgment they trusted, and these men could be trusted to select the President.

The final decree of the Convention is given in the second clause of Article II, Section I, of the Constitution:

"Each State shall appoint, in such manner as the Legislature thereof may direct, a number of Electors, equal to the whole number of Senators and Representatives to which the State may be entitled in the Congress; but no Senator or Representative, or person holding an office of trust or profit under the United States, shall be appointed an Elector."

Congress was given power to determine the day of choosing the electors and that on which they should give their votes; this power is exercised at present under Act of Congress of February, 1887, as amended in October, 1888.

Each state in choosing electors acts independently of every other state. One may nominate its electors for the state at large, so that each citizen votes for the total number; another may have an elector for each Congressional district and two electors for the whole state, corresponding to its Senators. Nomination is sometimes in primary elections, sometimes in party conventions. Electors are chosen on the first Tuesday after the first Monday in November. Usually the whole body of electors chosen by a state is of one political party. As soon as all ballots have been counted, the governor of each state must certify to the Secretary of State of the United States the names of the electors selected and the full circumstances attending their choice.

The electors in each state meet in their state capital on the second Monday of January following the November election, and there ballot for President and Vice-President. Up to that date, although everybody knows who are to be the next President and Vice-President, not a single vote has been cast for these officials. The electors have full legal right to cast their ballots for whomsoever they please, except that of the men they name for President and Vice-President one at least "shall not be an inhabitant of the same state as themselves" (Article XII, *Amendments*). However, there is the strongest moral obligation to vote for the men placed in nomination at the national convention of their party during the preceding summer. There never has been a case where an elector has disappointed his constituents by voting otherwise than as expected by the people who chose him.

Three copies are made of the record of the vote of the electors. One copy is filed in the office of the secretary of state at the state capital; one is given to the United States District Judge in the Federal district in which the state capital is located; the third is forwarded by special messenger (one of the electors) to the Secretary of State of the United States.

Congress is required to be in session on the second Wednesday of February following the meeting of the electoral college. At 1 o'clock in the afternoon of that day the Senate and the House of Representatives meet as one body in the hall of the House of Representatives, presided over by the President of the Senate. The Secretary of State sends the reports from the various states, and the seals are broken by the presiding officer, who announces the vote of each state. Not until the result of the complete count is announced can the election be concluded formally and legally.

Even at this stage it may happen that no election has resulted, for the law requires the successful candidate for President to have received a majority of electoral votes. If no candidate has a majority, then the House of Representatives must elect a President and the Senate a Vice-President. In this case the vote in the House of Representatives is by states, each state having one vote. The wish of the majority of each state delegation shall determine the vote of its state, and the choice must be from the three men receiving the highest vote in the electoral college. In the Senate the choice must be from the two men receiving the highest vote for Vice-President in the electoral college.

Because the electoral college no longer actually chooses the nation's chief executive, as the framers of the Constitution intended, but is merely the instrument in a formal and rather expensive procedure, there has been much talk of abolishing it and choosing the President by direct vote. The number who favor doing so was increased by the election of 1916, in which the candidate receiving the minority of the popular vote very nearly obtained a majority of the electoral vote. E.D.F.

Consult Bryce's *American Commonwealth* for the views of an eminent Englishman on the electoral system of the United States.

ELEC'TORAL COMMISSION, a commission appointed by the United States Congress to decide the Presidential election of 1876, which both Republicans and Democrats claimed to have won. The Commission was appointed on January 28, 1877, to investigate the electoral returns from Florida, Louisiana, Oregon and South Carolina, from which states conflicting

returns had been sent to Washington, each party advancing strong arguments for the legality of its returns in each state. The contentions arose over the proper election of the Presidential electors. Without the votes of the disputed states, Samuel J. Tilden, the Democratic candidate, lacked only one vote of the necessary majority, while Rutherford B. Hayes, the Republican candidate, needed the twenty votes which were in dispute.

To settle the matter as justly as possible Congress created a commission of fifteen members, composed of five Supreme Court Justices, five United States Senators and five Representatives; this group politically contained seven Democrats and eight Republicans. With the exception of Bradley, one of the Justices, the commission was evenly divided; Bradley cast his vote with the Republicans and decided against the claims of the Democrats that charges of fraudulent voting and manipulation of returns should be investigated. All questions were then decided by a strict party vote, and the election was given to Hayes. The commission's decision was awaited with intense interest throughout the country, and the Democrats were obliged to accept the result, but they have always contended that Tilden and not Hayes was rightfully elected.

Related Subjects. The reader is referred to the following topics in these volumes:

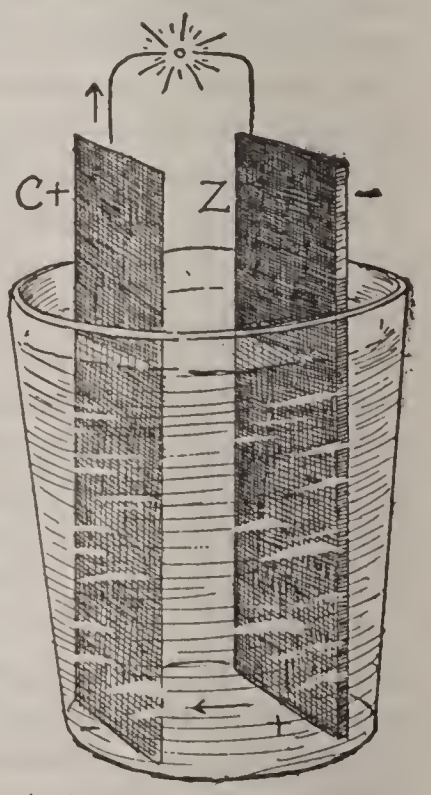
Election
Electoral College
Hayes, Rutherford Birchard
Tilden, Samuel Jones
United States, subtitle *History*

ELECTRA, *e lek' trah,* the name of several personages in Greek mythology, but referring principally to the daughter of Agamemnon, a king of Argos, and of his wife Clytemnestra, who murdered her husband upon his return from the Trojan War. Different motives have been assigned for this tragedy, one of which was the queen's jealousy of Cassandra, the Trojan prophetess, whom Agamemnon brought home a captive. Electra influenced her brother Orestes to avenge the death of their father by slaying Clytemnestra. Later she became the wife of her cousin Pylades. She is the subject of a number of ancient dramas, notably those of Sophocles and Euripides, and also figures in modern literature.

ELEC'TRICAL FISH, the name applied to various kinds of fishes possessing organs by means of which they can give an electric shock. These organs are composed of cells located in various parts of the body in different species. They use this power in attacking prey or as a weapon of defense, and the effect is the familiar tingling sensation produced by an electric battery. In the electric rays, or torpedoes, the electric organs lie in the head and gill region, and the current passes vertically from the lower to the upper side. After a period of exercise, the power becomes exhausted and is not restored until the fish has had rest and food. The strength of the electric discharge depends on the health, size and vigor of the fish.

Another species of electrical fishes is found in the large rivers of the tropical part of Africa. These, known as the electric catfish, are said to give a shock like that from a Leyden jar. The thick, scaleless electric eel of South America, which sometimes grows to be six feet in length, is the most powerful of the group. Its electric organs, which lie upon the underside of the tail, have sufficient power to stun an animal as large as a horse.

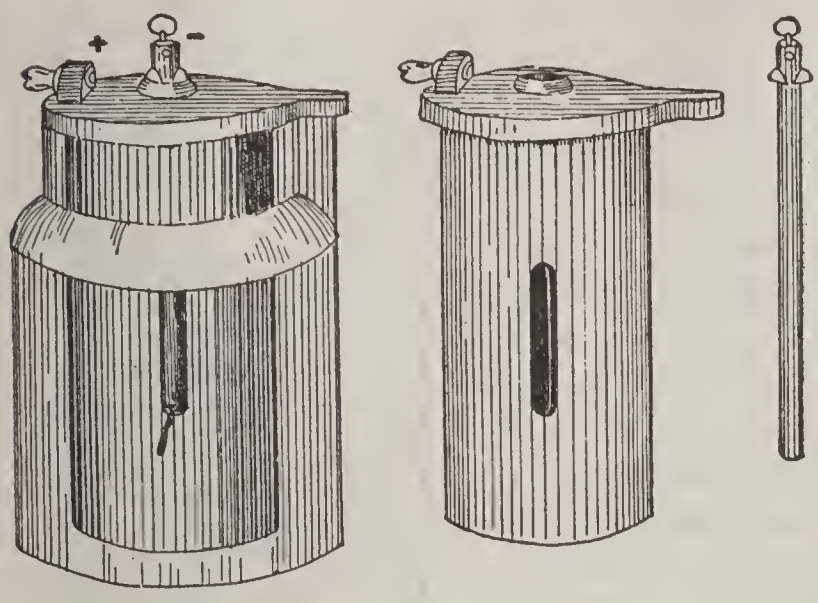
ELEC'TRIC BAT'TERY, a device for producing an electric current by means of chemical action. To make a simple electric battery it is only necessary to place in a glass jar a solution of sal ammoniac, made by dissolving four ounces of sal ammoniac in a quart of water, and to place in this solution a rod of zinc and a rod of carbon. A carbon rod such as is used in an electric arc light may be used. A dilute solution of any of the common acids may be used in place of the sal ammoniac. If an electric bell is connected by copper wires to the carbon and zinc rods of the battery the bell will ring. If the battery is used for some time the zinc will disappear, for it is acted on by the sal ammoniac, forming zinc sulphate, which goes into the solution.



A SIMPLE ELECTRIC BATTERY

The First Battery. The first electric battery was made by Alessandro Volta, an Italian physicist. It consisted of disks of zinc and copper arranged in pairs, and upon each pair of disks a piece of moistened paper. The disks and paper thus formed a pile which

looked somewhat like a round stick. An electric shock could be obtained from the pile of disks. This battery was called *Volta's pile;* it was also sometimes called the *electric stick.*



SAL AMMONIAC BATTERY

Volta also made a battery of zinc and copper strips placed in dilute sulphuric acid; a number of pairs of such strips were used, each pair being in a glass tumbler containing a portion of the acid solution. This battery was called the *crown of cups.*

How a Battery Works. The working of an electric battery can be best understood by a study of a simple cell made like Volta's crown of cups. A strip of zinc and a strip of copper, if placed in contact in air, would each become electrically charged, the zinc having a positive and the copper a negative charge. If the two strips are placed in dilute sulphuric acid, hydrogen from the acid goes to the copper strip. The hydrogen carries a positive charge and gives this charge to the copper; the remaining part of the acid goes to the zinc, giving the zinc a negative charge. Thus by the action of the acid the copper becomes positively charged; the zinc, negatively charged. If the two strips are connected by a conductor of electricity, such as a copper wire, the electric charges flow along the wire, the positive charge flowing from copper to zinc, the negative charge from zinc to copper. The action of the acid continually renews the charges on the copper and the zinc, and a current continues to flow along the wire. (See illustration, "A Simple Electric Battery," page 1980.)

Since the positive charge flows from the copper through the wire, the copper is the *positive electrode,* or the *positive pole,* of the battery. Since the positive charge is carried from the zinc through the liquid to the copper, and since when zinc and copper are placed together in air the zinc becomes positively charged simply by its contact with the copper, the zinc is the positive plate. During the action of the battery the zinc is being continually eaten away by the acid, forming zinc sulphate, which can be obtained as a white powder by evaporating the liquid. It is the action of the acid upon the metal plates which produces the electric current. Chemical energy is therefore changed into electrical energy.

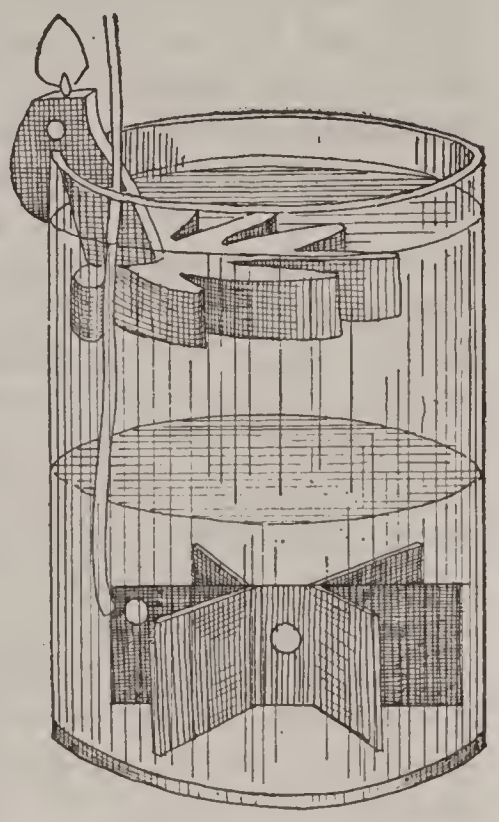
Polarization. The hydrogen which collects on the copper in the simple voltaic cell is necessary to the working of the cell in order to give the copper a positive charge, but if the hydrogen remains on the copper it hinders the flow of the current. This action of the hydrogen is called *polarization.* Polarization is due to the resistance which the hydrogen offers to the passage of the current and to an electromotive force which the hydrogen produces, opposing the main electromotive force of the battery.

A storage battery requires a current from some outside source, changing the plates and the liquid in the cell by electrolysis before it is ready to deliver any considerable amount of electrical energy (see ELECTROLYSIS). Storage batteries are sometimes called *secondary batteries.* Batteries that do not require the action of an electric current upon them, but are ready as soon as the materials are put together to deliver current, are called *primary batteries.* Primary batteries cannot be charged by an electric current as can storage batteries, but can be renewed only by renewing the liquid or the positive plate, or both.

Primary batteries are of two kinds: first, those that do not polarize and therefore will deliver current at constant strength for a long time; second, those that polarize and therefore can deliver current for a short time only, after which the circuit must be open so that the battery can recover. The first kind are called *closed-circuit batteries,* because the circuit can be kept closed for a long time; the second kind are called *open-circuit batteries,* because the circuit must be open most of the time. In most closed-circuit batteries the plates would waste away if the circuit were left open. An open-circuit must be made of such materials that the plates will not waste away when the circuit is open. The most important closed-circuit batteries are the gravity, Daniell and the Edison-Lalande cells.

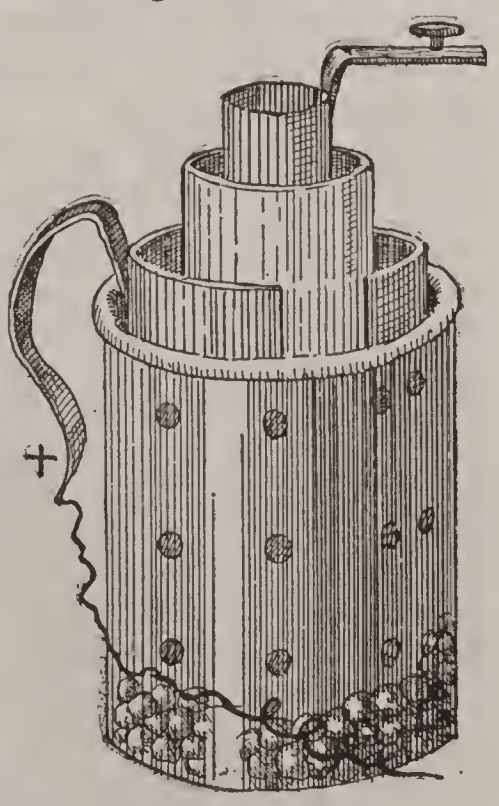
The Gravity Cell. Polarization is prevented in the *gravity cell* by placing the copper in a solution of copper sulphate. The zinc is in a

solution of sulphuric acid. Hydrogen is set free by the action of the acid on the zinc, as in the simple voltaic cell, but when the hydrogen ions reach the copper sulphate they exchange places with copper ions (see Ion). These copper ions go to the copper plate, carrying positive charges. Copper is thus added to the copper plate, making it heavier but in no way interfering with the current. The copper and copper sulphate are placed in the bottom of a glass jar, the zinc and sulphuric acid above the copper sulphate.



GRAVITY CELL

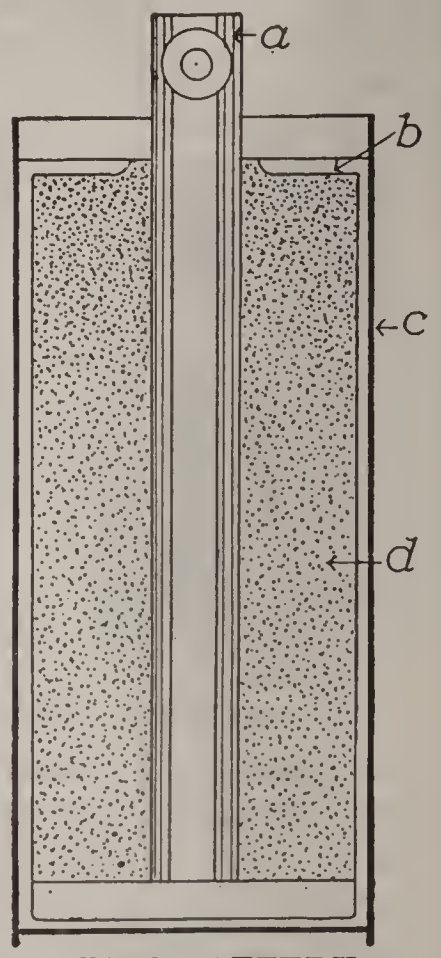
Gravity aids in keeping the liquids separate, the copper sulphate solution being heavier than the sulphuric acid solution. A gravity cell can be set up simply by placing the copper plate in the bottom of the jar and the zinc plate near the top, placing some crystals of copper sulphate in the jar and filling it with water. It is a number of hours after the cell thus set up is placed on a closed circuit before it is ready to give a strong current, but it will then furnish current for a number of weeks. The only attention necessary is to keep the jar filled with water and add copper sulphate crystals from time to time, if the blue color disappears. A small quantity of sulphuric acid is formed by the action of the copper sulphate, which works its way up to the zinc. The action of the cell is then the same as that described above.



DANIELL CELL

Other Cells. The so-called *Daniell cell* is made of the same materials as the gravity cell, the liquids being separated by a porous cup. Gravity cells are used in short-distance telegraphy and in block signaling.

In the *Edison-Lalande* cell the negative plate is made of copper oxide. The hydrogen which comes to this plate when the cell is working is disposed of by combining with the oxygen of the copper oxide so that the cell does not polarize. This cell will work on either open- or closed-circuit.



DRY BATTERY

(*a*) Carbon.
(*b*) Porous substance with sal ammoniac.
(*c*) Zinc.
(*d*) Black manganese dioxide.

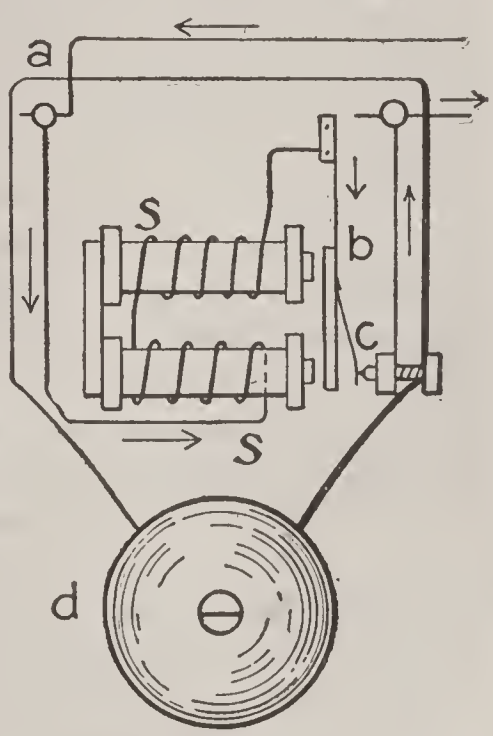
The Bunsen battery is a form of closed-circuit battery formerly used but now replaced by the cells mentioned above. The Grove cell, which preceded the Bunsen cell, consisted of a zinc plate in sulphuric acid and a platinum plate in nitric acid, one of the liquids being in a porous cup. Bunsen and Cooper, working independently, improved this cell for practical purposes by using carbon in place of platinum. The nitric acid prevents polarization, hydrogen combining with some of the oxygen of the acid and forming water instead of collecting on the carbon plate.

LE CLANCHÉ BATTERY

Of open-circuit cells the dry cell and the Le Clanché cell are the most important. The outside of a *dry cell* is a zinc cup which forms the zinc plate of the cell and at the same time contains the other elements of the cell. Within the zinc cup is, first, a porous substance con-

taining a solution of sal ammoniac, next some manganese dioxide in the form of a black powder, and within this a strip of carbon. The sal ammoniac acts on the zinc when the cell is producing a current. The manganese dioxide is a depolarizer which slowly removes the hydrogen from the carbon after the cell has polarized. The Le Clanché cell consists of zinc and carbon plates in a solution of sal ammoniac. E.E.B.

ELECTRIC BELL, a bell that is rung by electric energy. The door bell is the most common illustration of bells of this type. The apparatus consists of an electromagnet *s,* an armature *b,* to which the clapper is attached, a spring that pushes against the screw *c,* and the gong *d.* The battery is usually placed in the basement and the wires connect it with the push button at the door, which is itself connected with the bell. When the button is pushed the circuit is completed and the current flows along the wire *a* and over the coils *ss,* magnetizing the core. The magnet attracts the armature *b* and causes the clapper to strike the gong. This movement removes the spring from contact with the screw and breaks down the circuit, so that the armature is released and moves back to its former position, which brings the spring in contact with the screw and again closes the circuit, so that the bell continues to ring as long as the pressure on the button is maintained. Any number of bells connected with the circuit may be rung by the same push button.

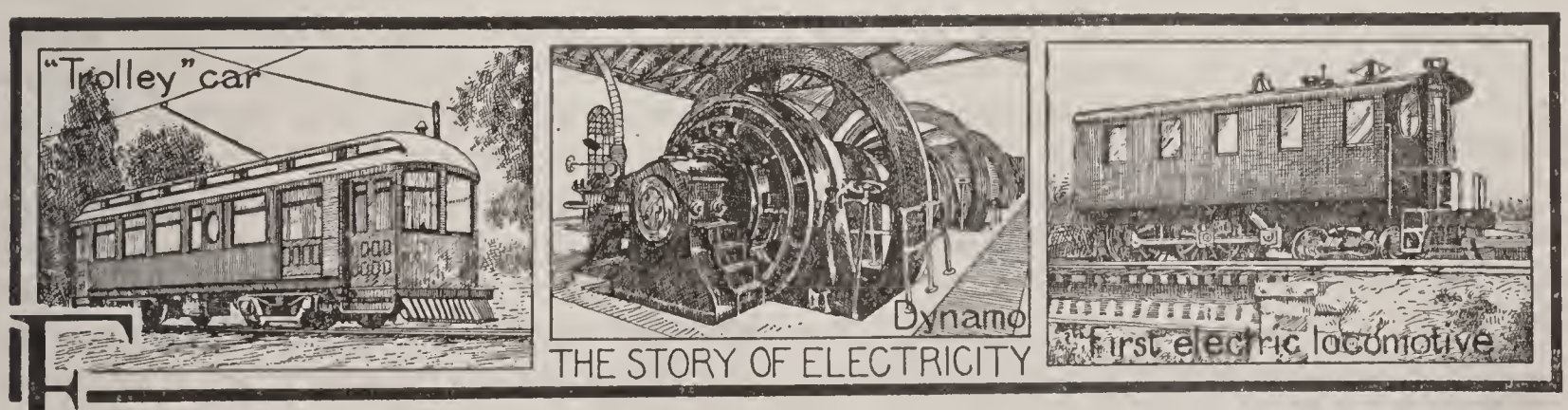


THE ELECTRIC BELL
The various parts are explained in the text.

When electric bells get out of order the trouble is likely to be with the battery, which is weak. If, however, the battery proves to be in good condition one should look at the adjustment of the screw with the spring *c.* Continuous use may jar the screw out of position so that the spring fails to make connection with it. A slight turn of the screw is all that is necessary to set matters right. See ELECTROMAGNET. W.F.R.

Consult White's *Electric Bells, Alarms and Signaling Systems.*

ELECTRIC HEATING. The production of heat by electricity depends on the fact that materials of high resistance are heated to a higher temperature by an electric current than materials of low resistance. This is shown by the fact that the wires in an electric water heater or an electric toaster become red hot, while the copper wires which conduct the current to the heater are scarcely warmed. Both wires carry the same current, but one having much greater resistance than the other is heated to a much higher temperature. For the same current the quantity of heat produced in a given time is proportional to the resistance; the temperature can be regulated by adjusting the resistance. Electric heaters for street cars and for houses are adjusted to produce sufficient heat to warm the air, but not to so high a temperature as that required for cooking.



ELECTRICITY, *e lek tris' i ti,* the agency which is known to people through a variety of effects commonly called *electrical.* The action of electricity is well understood, but very little is known of its nature. We know well what it *does,* but not what it *is.*

The world has been more than 2,500 years in securing its present knowledge of electricity and electrical effects, and nearly all of our knowledge has come to us within a period of 300 years. Indeed, it can be said that the practical application of electricity to the needs

of mankind is to a remarkable extent a development within the memory of men yet living.

About 700 B.C. a very wise Greek named Thales discovered that a piece of amber rubbed with cloth possessed the power of attracting feathers, pieces of paper and other light bodies to it. Probably other men of that early day noted the same phenomenon, but we only know that Pliny, who died A. D. 114, left the next recorded experiments in the same direction. He knew of the loadstone and likened it to the amber, but did not guess there could be a connection between the two. An Englishman named Gilbert, who died in 1603, gave the world the name *electricity*. Very properly he gave credit to the early Greek who left recorded experiments with amber. The Greek name for *amber* is *electron,* so Dr. Gilbert gave the name electricity to the phenomena which the crude experiments of the day produced. The student who reads in this work something of the lives of Isaac Newton, Volta, Faraday and Davy will learn of the various discoveries and inventions, each of which brought the world one step nearer to present-day electrical knowledge. It would be desirable to learn also that it was Benjamin Franklin who proved to the world that *lightning* and *electricity* are identical in meaning.

Through the later discoveries of Lord Kelvin (Sir William Thomson), Morse, Gray, Bell, Edison, Marconi and others, we begin to believe that the world has reached really the electrical age, although beyond any doubt we are yet on the threshold of electrical discoveries and their applications.

To-day, with electricity we light our houses; illumine our streets; cook food; run trolley cars at sixty miles per hour and heavy passenger trains at nearly as great a speed; lift immense weights; tunnel through solid rock; heal the sick; talk over distances of 3,000 miles and send messages even farther through the air without wires. To secure these great benefits electricity is harnessed and applied to its task through proper machinery by which it is brought to the place where work is to be performed.

To understand something of its wonderful properties we must know that electricity will travel through or along certain substances, but will not traverse other substances. The various electrical effects were formerly classified under the headings of *static,* or *frictional,* electricity, and *current* electricity. A better classification, in view of the present-day theory is:

(1) Electrical effects upon nonconductors or very poor conductors of electricity;
(2) Electrical effects upon conductors;
(3) Electrical effects in space.

Conductors and Nonconductors. Any substance, such as copper, through which electricity flows freely is called a good *conductor* of electricity. Any substance through which electricity under ordinary conditions does not flow at all is called a *nonconductor,* or an *insulator.* Glass is practically a nonconductor. A substance through which electricity flows with great difficulty is a poor conductor of electricity. A wet trolley pole is an example; if the wire were to touch the wet pole a weak current of electricity would flow along the pole to the ground. On the other hand, if the pole were dry it would not conduct the electric current.

Electrical Effects upon Nonconductors. Such effects as are noted below are familiar to us in every-day experience. Stroking the fur of a cat causes a crackling sound and the hairs to be attracted by the hand. When a person walks across a carpet on a cold day his body becomes electrically charged and a spark passes if the hand is brought near a metal object such as a gas jet. By rubbing briskly with a flannel cloth a rubber comb or penholder may be easily electrified, so that it will attract light objects such as bits of paper.

When any two objects of different material are rubbed together or merely placed in contact each becomes electrically charged and the charges remain on the objects when they are separated. The two charges thus produced act in opposite ways. This may be shown in the following manner: A small piece of pith such as may be found in a corn stalk is rolled into a ball and suspended by a thread. A rubber penholder or a rod of hard rubber is then electrified by rubbing it with a woolen cloth. If the penholder is then held near the pith ball the ball is first attracted to the penholder, then touches it and takes up part of the electric charge. It then flies away from the penholder. The pith is now repelled by the rubber and attracted by the cloth. The cloth and the rubber each has an electric charge. One charge attracts the charge on the pith ball, and the other repels it. Any electrical charge that is repelled by the charge on the penholder is attracted by the charge on the woolen cloth. An electrical charge of the same kind as the one on the rubber penholder is called a *negative* charge. Any charge of the same kind as the

one on the woolen cloth is called a *positive* charge. Whenever any object is electrified it has either a positive or a negative charge.

When two unlike charges, a negative and a positive, are separated by an air space, they attract each other. The air resists this action and tries to hold the charges apart. If the attraction becomes strong enough to overcome the resistance of the air a spark passes, which is a discharge through the air. A stroke of lightning is a series of such discharges in the clouds or between a cloud and the earth. A discharge through the air is always accompanied by heat and light. In such a discharge the electricity is for an instant in motion.

Two charges of the same kind repel each other. Two pith balls charged from a rubber rod and suspended by threads repel each other, because they have charges of the same kind. The human body may be electrified if one stands on hard rubber or other insulating material and touches one knob of an electrical machine in operation. The hair then bristles up, because all the hairs have the same kind of charge and these charges repel each other.

To sum up: Electrical effects upon nonconductors consist of:

(1) Electrical charges at rest—the charges being of two kinds, positive and negative, two unlike charges attracting each other so that a strain is produced in the space between them;

(2) Electrical charges in violent motion—that is, a discharge through air or some other poorly conducting substance, the discharge being accompanied by heat and light.

Electrical Effects upon Conductors. If an object which is a good conductor of electricity receives an electric charge, the charge distributes itself over the entire surface of the object. If a copper wire receives an electric charge at one end the charge flows along the wire until it is distributed along its entire length. This happens so quickly that it is practically instantaneous. On the other hand, if a glass rod receives a charge at one end the charge remains at that end. An electric charge cannot flow along a glass rod, but remains on that part of the rod which first receives it. One end of a glass rod may be charged and the other end uncharged, but it is impossible to charge one end of a metal rod without the entire rod becoming charged. This is the difference between conductors and nonconductors.

If a metallic conductor such as a copper wire receives a positive charge at one end and a negative charge at the other end, the two charges flowing along the wire in opposite directions tend to neutralize each other. Thus, if the two knobs of an electric machine are connected by a copper wire there is a flow of electricity along the wire which is practically instantaneous, and the machine is discharged. During the discharge there is a current of electricity lasting only a small fraction of a second. If the positive and negative charges at the ends of the wire could be renewed as rapidly as the discharge takes place, there would be a continuous flow of electricity along the wire—a real electric current. This could be done by continuing to turn the handle of the electric machine, but it would not be a practical method; the current produced by the electric machine is too small. There are two practical devices that can be used; they are the electric battery and the dynamo. Either of these when properly connected to the ends of the wire furnishes a continual supply of positive electrification at one end of the wire and negative at the other end. These two kinds of electrification flow along the wire in opposite directions, neutralizing each other.

Definition. An electric current, then, consists of a continuous flow of positive electrification in one direction and negative electrification through the same conductor in the opposite direction. The direction in which the positive charge flows is always taken as the direction of the current.

What Is Electricity? The best answer that can be given to this question is to state clearly what scientists generally believe electricity to be—in other words, to state the modern theory of electricity. It must be remembered that scientists are every year discovering important new facts regarding electricity and that new discoveries may change the theory. With this understanding, we shall proceed to state the modern theory, known as the *electron theory,* as if it were proven so completely that it could never be questioned.

Before the discovery of electrons an atom was supposed to be the smallest particle of matter. Atoms are so small that no microscope makes them visible; they combine to form molecules, and a molecule is therefore larger than an atom. Yet molecules are so small that it takes millions of molecules of air to fill an ordinary thimble. It would take about two and one-half million atoms of mercury to make a row one inch long. If we write the figure 4 followed by twenty-six zeros, we would have approximately the number of molecules of hydrogen that would weigh one grain;

it would require twice as many atoms, since there are two atoms of hydrogen in one molecule. But atoms are not the smallest objects in nature. The electron is so small that it requires about two thousand electrons to equal one hydrogen atom in weight. These extremely small objects which we call electrons are the source of all the interesting effects which we call electrical. See ATOM; MOLECULE.

Atoms are not electrically charged under ordinary conditions, but electrons are always electrically charged. Every electron, everywhere and always, carries an electric charge. It is believed that the electron itself is the electric charge. The curious thing is that every electron carries exactly the same amount of electric charge as every other electron. The quantity of electric charge carried by every electron is called the *elementary electric charge.* It is the smallest electric charge known to exist. When an electron is added to an atom the atom is charged negatively. When an atom which is uncharged has an electron taken away from it the atom becomes positively charged.

How the Current Flows. To understand how an electric current flows through an electrical conductor such as a copper wire, we must picture to the mind the atoms of copper of which the wire is composed, with the inevitable spaces between them. If a flask were made of copper and tightly closed and then placed under very great pressure, water could be made to pass through the sides of the flask before the flask was broken, showing that there are spaces between the atoms of copper through which water can pass. No matter how compact a substance may appear, there are spaces between the atoms of which it is composed. If we imagine the atoms of the copper wire with spaces between them and electrons, much smaller than the atoms, moving freely from atom to atom, we have a picture of what goes on in a copper wire when it carries an electric current. The current in the wire consists of electrons passing from atom to atom throughout the length of the wire somewhat as a water bucket is passed from hand to hand in a bucket brigade. The atoms are set in more rapid vibration by the motion of the electrons. In this manner the current heats the wire, for the vibration of the atoms constitutes heat.

To understand electrical action in space it is necessary to understand what is meant by the ether. Let us use an illustration to make this clear. If an incandescent electric light bulb is broken there is a loud report as the air rushes in to fill the space. The air had been pumped out of the bulb until only about one-millionth part of the air which was at first in it remained. Practically all the air was removed, yet something remained in the bulb which was able to transmit the light across the space between the white hot filament and the glass. This something is called the *ether.* Ether fills all space not occupied by material objects. Ether transmits the light of the sun through space; it fills the spaces between the atoms of every substance; it can be caused to vibrate in a certain way by an electrical disturbance, and such vibrations travel through the ether in the form of waves. These waves, if they are short enough, from about 1/30,000 to about 1/50,000 of an inch in length, constitute light, and affect our eyes; if they are longer, our eyes are not affected by them. We call the longer waves in ether electric waves, or, more accurately, electromagnetic waves, and make use of them in wireless telegraphy. A special receiver is made which is sensitive to the longer waves. The human eye is a sensitive receiver for the shorter waves.

Velocity. Electrons by their motion set up waves in the ether. These waves travel through space with a speed of about 186,000 miles per second. The waves set up by the electrons may be of the longer kind used in wireless telegraphy, or they may be of the shorter kind known as light. When an electric current is flowing along a wire such waves are set up all around the wire by the motion of the electrons in the wire, and these waves follow the course of the wire. The waves in the space around the wire transmit the power of the electric current.

In an insulator, such as glass, the electrons cannot move easily from atom to atom. When they do move through an insulator as through air they do so with great violence. In an insulator the electrons are bound to the atoms; hence, under ordinary conditions no current can flow through an insulator.

When an electric current flows in a coil of wire the coil acts in all respects like a magnet. The current flows around the coil in nearly complete circles. An electric current flowing in a circle has magnetic poles, one face of the circle being a north pole and the other face a south pole. It is believed that in a magnetic substance such as iron the electrons move in circles around the atoms. Each atom with an electron circling about it has a north pole and a south pole.

How Electricity Is Produced. An electric discharge in air, an electric spark, may be produced by an electric machine, an induction coil, or a transformer. In nature such a discharge occurs in lightning. An electric current is produced either by an electric battery or a dynamo. These devices do not in reality produce electricity, for the electricity is present all the time. They merely set the electricity in motion, or produce an electrical tension, or force. Electricity in motion possesses energy; hence these devices produce electrical energy. Energy in some other form is always consumed by these electrical devices to make up for the electrical energy which they give out. For example, a dynamo must always be run by some form of mechanical power such as a steam engine; hence a dynamo uses mechanical energy and gives out electrical energy.

How Electricity Stores Energy. It is commonly believed that electricity can be stored. This is an error. Though electricity itself cannot be stored, it can be used to store energy and this stored energy can be made to produce an electric current. This is accomplished by means of a storage battery.

Electricity as a Cause of Death. With the increasing use of electric currents deaths caused by contact with "live wires" have become increasingly frequent. It is well to know the cause and the means of preventing such accidents.

The human body to a certain extent is protected from electric shock by its high resistance. The resistance of the body is much greater when the skin is dry than when it is moist; therefore, it is safer to handle an electric wire with dry hands than with moist hands. Careful tests have shown that the resistance of the body may be as high as 4,000 ohms when the skin is perfectly dry, and as low as 500 ohms when the skin is thoroughly moistened. The average resistance of the human body is probably about 1,200 ohms.

Alternating current is more dangerous than direct current for the reason that the injurious effect is due chiefly to the shock caused by the changing of the current. With direct current the shock is felt only at the instant of starting and of stopping the current. See CURRENT, ELECTRIC, subheads *Direct Current; Alternating Current.*

The voltage that will destroy life depends on various conditions, but it is fairly well established that no human being can withstand an alternating electromotive force of 1,500 volts of ordinary frequency. Three hundred volts alternating have been known to produce death. It must not be inferred that it is safe to toy with lower voltages than those mentioned. Lower voltages may produce severe burns and other injurious effects.

The cause of death by electric shock is generally believed by medical authorities to be the action of the current on the heart, producing contraction of the fibers of that organ, resulting in stopping the circulation. The nervous system dies as a result of anaemia following the sudden arrest of the circulation of the blood. Death may also be due to asphyxia if the current passes only through the brain and upper portion of the spinal cord, arresting only the action of the nerve centers which control breathing. Death by electricity is not instantaneous, but the experience of persons who have been rendered unconscious by electric shock and have recovered indicates that it is not painful.

Emergency Directions. The treatment in case of severe electric shock consists in keeping the body warm by wrapping it in warm blankets or clothing and applying heat by some means, such as hot water bottles to the feet, and using artificial respiration as in a case of drowning. If the patient when found is still touching the wire, it is not safe to touch his body or the wire with the bare hands. He should be pulled away from the wire by the clothing or the wire may be torn from his grasp with a dry stick. With a thick leather glove on the hand it is safe to take hold of the body or the wire, if the glove is dry. E.E.B.

Uses of Electricity

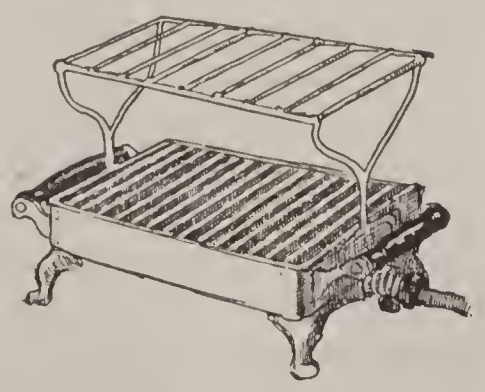
Electricity has become our willing and ready servant. Within the last half century the discoveries of new powers of this remarkable force and the invention of machines for utilizing these powers have constituted some of the greatest wonders in the world of science. The first important application of electricity to practical service was in the operation of the telegraph in 1844 (see TELEGRAPH). The invention of other devices was slow until about 1880, but since that time these inventions have increased rapidly, both in number and variety. The uses of electricity are so many that it is nearly impossible to enumerate them. So

gradually has this subtle force extended its sway over civilization that there is scarcely an industry that does not depend upon electricity or is not modified by it.

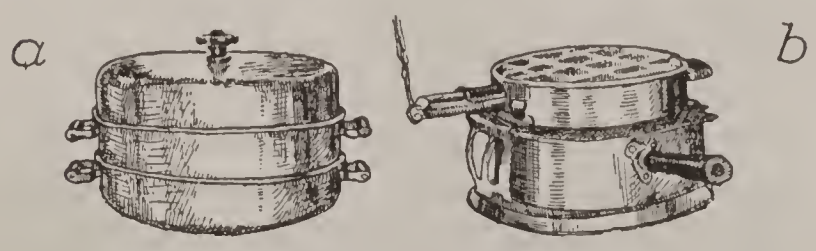
The larger uses of electricity are described in special articles referred to below. It is the purpose of this article to call attention to a number of minor uses that are not so well known, but which are practically within the reach of all.

Household Economy. The application of electric energy to the operation of machinery enables the housewife to change what was formerly drudgery into a delightful occupation. The electric motor, which can be installed at slight expense and operated by attaching it to an electric light socket, runs the sewing machine, the washing machine, wringer and the vacuum cleaner. The application of electric energy to the production of heat (see ELECTRIC HEATING) and the invention of innumerable devices for household use make housekeeping a pleasure and enable the wife and mother to devote time and energy saved by these devices to recreation and culture. First among these conveniences may be mentioned the electric iron, which is heated by the passage of the current over the resistance coil, *a*. Attach the cord to the lamp socket and in a few minutes the iron is ready for use. By means of the electric toaster, of which there are numerous types, the toast for breakfast can be made at the table and served hot. The toaster shown here can be used for heating other articles, as well. The heating coils are in the box and are shown by the shading below the wires. The ovenette is a small electric oven. The part *a*, shown in the illustration, sets over *b*, which contains the heating coils. This little device is as efficient for its purpose as the large oven of a gas or coal range. But perhaps the most unique device is the nursery milk warmer, shown herewith. By setting the bottle in the coil the milk is soon warmed at any hour of the day or night. To these devices add electric coffee pots, percolators, stoves and grills, and it is readily seen that the electric current can be made to perform a great variety of household duties.

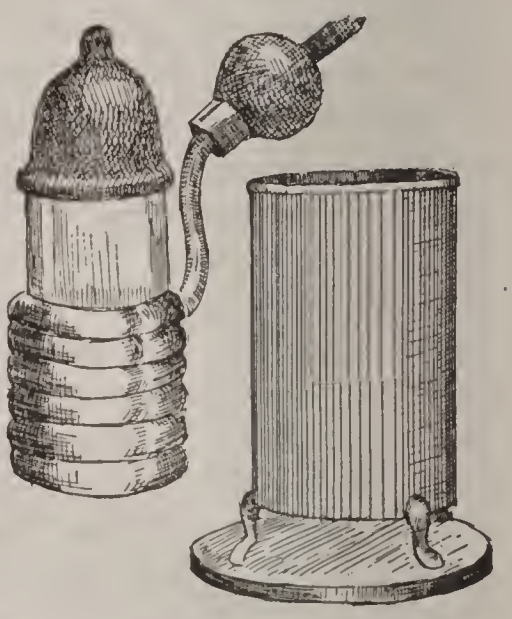
ELECTRIC IRON
The coil *a* shows how iron is heated.



ELECTRIC TOASTER



AN OVENETTE



ELECTRIC MILK WARMER

Electricity on the Farm. Wherever the farmer can procure electric energy he can use it to the saving of time and expense, by the use of the electric motor to run the washing machine and wringer, the churn and the sewing machine for the mistress of the home; by using the same motor to turn his grindstone, run his feed grinder and any other machine about the buildings. Another and equally valuable use of the electric current on the farm is for the production of electric light. The farmer may obtain his current from some electric company by running wires from the nearest point on their cables to his premises, or, if he has a water power site on his land, by installing a private dynamo. However, the former plan is the less expensive.

Electricity and War. The War of the Nations led to uses of electricity never before attempted. All aeroplanes depend upon electricity for ignition. Electric searchlights and range finders are controlling factors in artillery fire. The largest guns are often aimed by directions given by officers far removed from the gunners, and they are fired by the use of the electric current instead of the old method of percussion. Without the storage battery to supply power the submarine would be unable to operate. Without the use of electricity

modern methods of warfare would have to be almost entirely changed.

Electricity in Medicine. The beneficial effects of electricity in stimulating the nerve cells and thus securing greater activity in the various organs and tissues of the body has long been known, but the use of electric energy in medicine has been extended far beyond this limit. In surgery it is used to destroy tumors and diseased tissue, for removing birthmarks and superfluous hair and for cauterizing wounds. Besides these uses there are others peculiar to the X-ray, which are described under the title ROENTGEN RAYS. W.F.R.

Consult Burns's *Electric Motor;* Burns's *Alternating Currents Simplified;* Durgin's *Electricity, Its History and Development;* Campbell's *Principles of Electricity;* Millikan's *Practical Lessons in Electricity.*

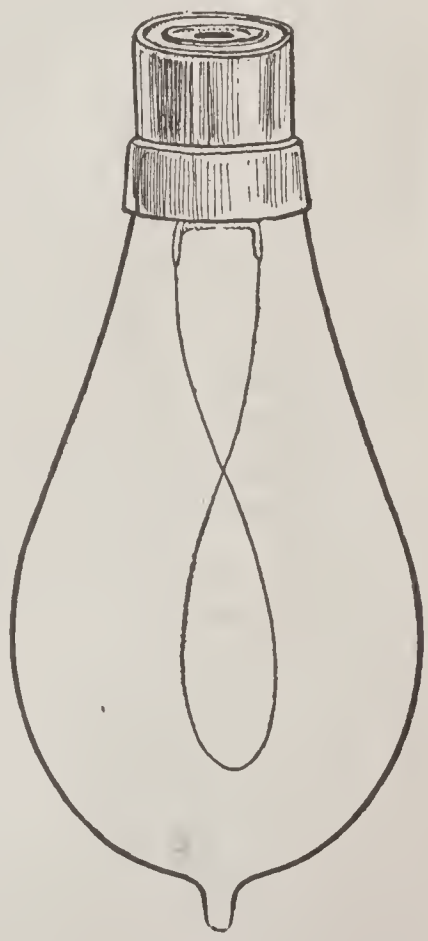
Related Subjects. The above article with its numerous subtitles does not much more than lay the foundation for the treatment given to electricity in these volumes. The following articles will be of interest in this connection:

Armature
Cathode Rays
Crookes Tubes
Current
Davy, Sir Humphry
Dielectric
Dynamo
Edison, Thomas A.
Electric Battery
Electric Bell
Electric Heating
Electric Light
Electric Machine
Electric Meter
Electric Motor
Electric Railway
Electric Welding
Electrochemistry
Electrocution
Electrode
Electrolysis
Electromagnet
Electromagnetic Theory of Light
Electromagnetism
Electrometer
Electromotive Force
Electroplating
Electroscope
Electrotyping
Faraday, Michael
Galvanic Battery
Galvanism
Galvanometer
Induction, Electric
Induction Coil
Insulator
Kilowatt
Lightning
Locomotive (subhead *Electric Locomotive*)
Magnet and Magnetism
Marconi, Guglielmo
Ohm
Roentgen Rays
Storage Battery
Telegraph
Telephone
Thermoelectricity
Vacuum Cleaner
Volt
Volta, Alessandro
Voltaic Pile
Watt
Wireless Telegraph

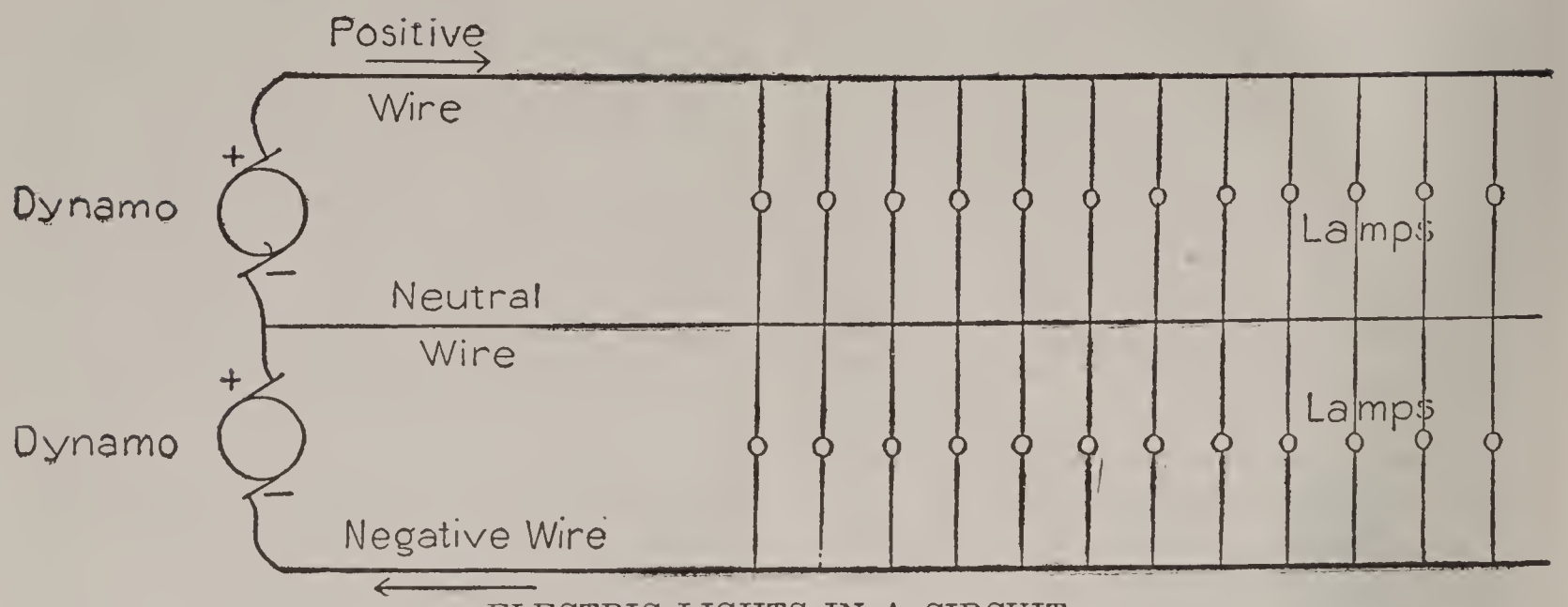
ELECTRIC, *e lek' trik,* **LIGHT,** a light produced by an electric current, a development of the latter part of the nineteenth century. Few people realize the extent to which electric light has changed the face of the earth, within the memory of fully one-third of the people yet living in the highly-civilized nations. Early in the nineteenth century men carried lanterns to find their way along city streets at night; later, illuminating gas was hailed as a great improvement, and prophets were dreaming of the time when a city might be as light by night as by day.

The electric machine produces a flash of light which lasts only a fraction of a second. This fact led inventors in the first decade of the nineteenth century to seek a means of producing a steady electric light. The earliest attempt that gave even a faint promise of success was that of Sir Humphry Davy, who with a battery of hundreds of cells produced an electric arc; the cost, however, was so great that this method of lighting was not thought practical. This was in 1813. In 1858 a light sufficiently strong for lighthouses was produced by means of magneto-electric generators. With the invention of the dynamo of Werner von Siemens and Zenobe Theophile Gramme, in 1866 to 1868, the system of arc lighting was greatly improved. The light could be used where a single powerful light was needed, as in a lighthouse or on city streets, but it was not suitable for house lighting. The invention of a practical incandescent light by Thomas A. Edison in 1878-1879 made it possible for the first time to have a large number of small electric lights suitable for use in houses.

The Incandescent Light. The ordinary incandescent light has a strange history. Soon after the discovery of the electric battery it was found that an electric current flowing through a wire will heat the wire, and if the current is strong enough the wire will become white hot and give out light. Here, then, was a means of producing electric light, but what kind of wire should be used? Platinum has high resistance and is easily heated to a white heat, but the platinum lamp when tried was found to be too expensive, both to manufacture and to operate. Carbon has high resistance and also is easily brought to a white heat, but a carbon filament made white hot in air



CARBON LAMP
Now largely abandoned in favor of more powerful lights at less cost.



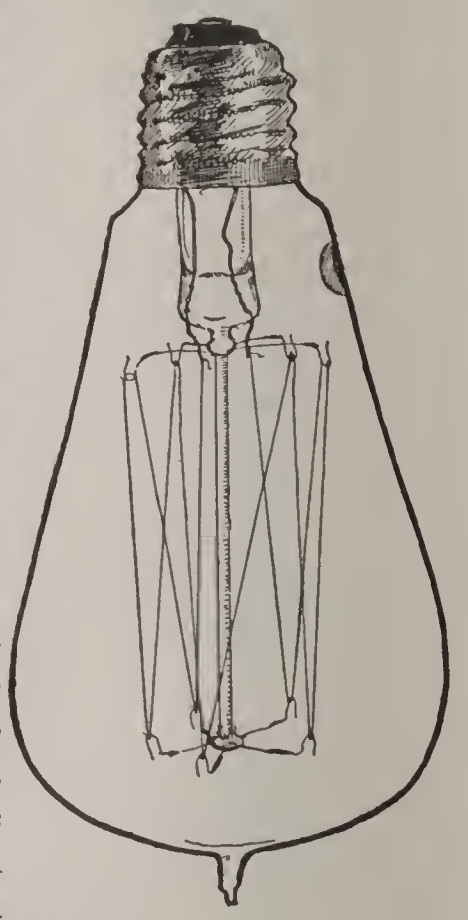
ELECTRIC LIGHTS IN A CIRCUIT
Multiple connection of incandescent lamps, three-wire system.

would last only a fraction of a second, for carbon burns in air. If carbon were used it would have to be enclosed in a vacuum, so that it could not burn.

The Carbon Lamp. It was Edison who in 1879 devised the first successful carbon filament lamp. This lamp consisted of a thread of carbon in a sealed glass globe from which the air had been pumped until only about a millionth part of the original air remained. Edison at first tried to make the thread of carbon by charring cotton thread, paper, wood —everything, in fact, that could be adapted to the purpose. Bamboo fiber was among the substances tried. It proved superior to the other materials and he began a search for the best form of bamboo. Men were sent to all parts of the world where bamboo grows and at the risk of their lives secured specimens of every known variety. The search cost about $100,000, and resulted in the adoption of a Japanese variety.

For a number of years the carbonized fiber of the bamboo was used and then replaced by the "squirted" filament. Such a filament is made by "squirting" a solution of cellulose through glass jets into alcohol. The alcohol hardens, that is, it coagulates, the cellulose, and this is afterwards carbonized by heat. The ends of the carbon filament are soldered to two platinum wires which are sealed into the glass and make connection with the electric current.

The Tungsten Lamp. This is in some respects superior to the carbon lamp. The tungsten filament when prepared by the "squirting" process was so fragile that the lamp could not be used where it would be jarred; but since the discovery of a wire-drawing process of preparing the filament tungsten lamps have been made of such durability as to make them suitable for use even in street cars. The great advantage of the tungsten lamp is its high efficiency. A tungsten lamp gives out about one candle power of light for every one and one-fourth watts of electrical power which it consumes, while a carbon filament lamp yields only about one candle power for every three and one-half watts. For the same amount of light, therefore, the cost is nearly three times as much when using the carbon lamp as when using the tungsten lamp.



TUNGSTEN LAMP
A lamp of high candle-power, rapidly supplanting the carbon lamp. It is popularly known as the "Mazda," its trade name.

The Nitrogen Lamp. A recent invention is an incandescent lamp filled with nitrogen. This is the most efficient lamp yet devised, for it furnishes more light for a given amount of electrical energy than any other electric light. A 2,000-candle-power lamp requires only 1,000 watts or only one-half a watt per candle power, while the ordinary tungsten lamp requires about one and a quarter watts per candle power. In the nitrogen lamp the filament, which is of tungsten, is heated to a white heat in the nitrogen which fills the bulb; but the filament cannot burn, for nitrogen is an inert gas, that is, it will not combine with other substances.

Lighting Circuits. Incandescent lamps are usually connected in multiple, with such an arrangement that each lamp may be turned on and off independently of the others. Low voltage lamps may be used on high voltage circuits by connecting them in series. For example: Suppose the voltage of a trolley line is 550 volts. The same lamps may be used in the street car as on a 110-volt circuit, but in the street car it is necessary to connect five 110-volt lamps in series. When this group of five lamps is connected to a 550-volt circuit there is a pressure of 110 volts at the terminals of each lamp. Low-voltage lamps, both carbon and tungsten, are made for use with batteries. The most extensive use of such lamps is for automobile lighting.

A common form of wiring lighting circuits is the three-wire system. Two of these wires, commonly called the *live wires,* form a 220-volt circuit. The third wire is neutral. The difference of potential between either of the live wires and the neutral wire is 110 volts.

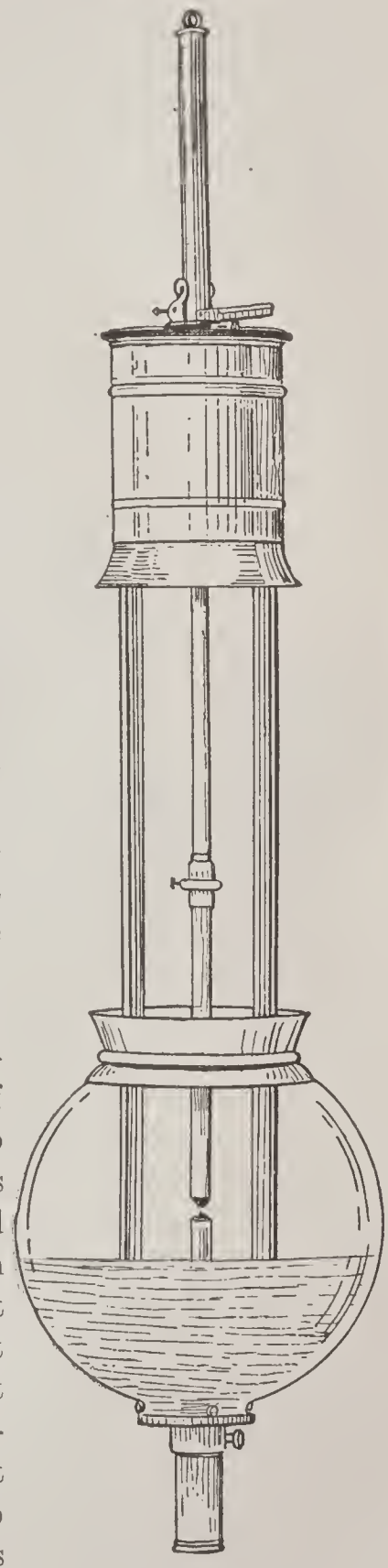
The Nernst Lamp. This lamp depends on the strange fact that many insulating substances become conductors of electricity at high temperatures. Even glass, which is one of the best insulators, when heated to a red heat becomes a conductor, and a current may then be passed through it sufficiently strong to cause it to incandesce, that is, to become white hot; and the glass may even be melted by the heat developed in it by the electric current.

The essential part of the Nernst lamp is the glower, a small rod of rare earths mixed with a binding material. This rod is an insulator at ordinary temperatures; therefore it must be heated to make it a conductor. The heater is a coil of platinum wire mounted close to the glower. When the current is turned on, the platinum wire quickly becomes white hot and heats the glower. As soon as the glower is heated sufficiently to conduct the current, the current passes through it and it instantly glows with an intense white light. The platinum coil is then automatically cut out of the circuit. The glower lights at a heat of about 1,740° Fahrenheit.

Mercury Vapor Lamp. The mercury vapor lamp gives out a bluish-white light containing almost no red rays. This light is good for photographic purposes, since the blue rays which it contains readily act on the photographic plate. In such a light a red rose appears almost black. The face of a person appears almost ghastly pale, the lips purple as if from asphyxiation. This lamp is a glass vacuum tube, usually three feet or more in length. The cathode is mercury; the anode, iron. To light the tube it must be placed in a horizontal position until the mercury extends the entire length of the tube and completes the electric circuit; then the tube is tilted so that the mercury drops back to one end. The electric current vaporizes a portion of the mercury and continues to flow, the mercury vapor being a good electrical conductor. The current causes the mercury vapor which now fills the tube to glow with a bright bluish-white light.

Lighting Trains and Automobiles. For lighting trains on a steam railroad, a combination of dynamo and storage battery is used. A dynamo geared to an axle of the car furnishes current for the lights when the train is running. When the train stops a storage battery is automatically switched into the circuit.

For electric lighting of automobiles a similar system on a small scale is used. The dynamo not only furnishes current for the lamps when the automobile is running, but charges the storage battery.

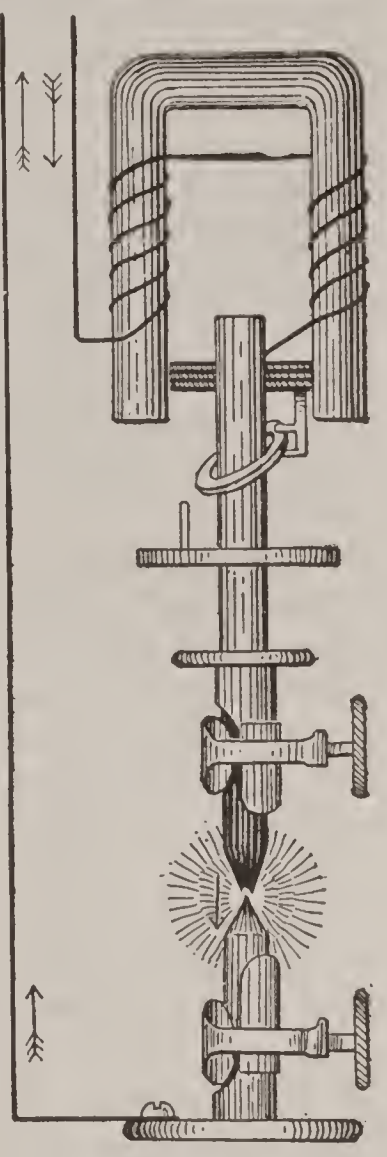


ARC LIGHT
Enclosed.

The Arc Light. When two rods of carbon are made part of an electric circuit so that a current flows through them, and the carbons are then separated by a short distance, the current continues to flow; but to flow from one carbon to the other it must cross the gap between them. This gap, if in air, offers very great resistance to the current. On account of this resistance intense heat is produced—so intense that it

vaporizes the carbon. This carbon vapor crosses the gap in a bluish stream curved like an arc of a circle, hence the term *electric arc.* The stream of carbon vapor is curved by the magnetic action of the current which it carries.

The heat of the electric arc is so intense that it is used for the electric furnace. If the arc is produced by a direct current, the carbon vapor flows from the positive to the negative carbon, and the tip of the positive carbon becomes hollow on account of the carbon flowing from it. This hollow space is called the "crater," and at the bottom of this crater is the highest temperature of the arc—nearly 6,300° Fahrenheit. When the arc is produced by an alternating current no crater is produced, for each carbon is alternately positive and negative.



ARC LIGHT
Showing parts.

Every arc lamp is provided with a mechanism which automatically "feeds" the carbons as they burn out, keeping them at a constant distance from each other.

A searchlight is an electric arc with a reflector for sending the beam in any desired direction. For such a light a focusing lamp is required. This lamp has a mechanism which feeds the positive carbon twice as fast as the negative carbon. This keeps the arc in the same position, since the positive carbon burns out twice as fast as the negative. Such lamps are used also for lighthouses, theater illumination, scenic effects, stereopticons, moving picture machines, photo-engraving, and as electric headlights in locomotives.

The flame arc is produced by means of carbons having cores which are impregnated with certain metallic salts which produce a yellow flame as the arc burns. The flame arc gives a more brilliant light, with greater penetrating power, than the ordinary arc.

The enclosed arc is an arc almost completely enclosed in a glass globe. In such a lamp the carbons are consumed very slowly because of the small amount of air admitted. The light, although less intense than would be yielded by the same electric power in open air, is more uniformly distributed.

Electric current can be used to light cities hundreds of miles from the source of the current. The current generated at Niagara Falls lights cities 250 miles away. The actual cost of electric lighting to the householder is slightly more than the cost of gas lighting for an equal amount of light, but the electric light more than saves its extra cost by its cleanliness. Walls and furniture require less attention in an electrically-lighted room than in one lighted by gas.

Dangers from electric wiring have been greatly exaggerated. When the wires are run in conduits, as they should be, there is absolutely no danger. Fires may result under very exceptional conditions when the wiring is "exposed," that is, supported on porcelain knobs instead of being run in metal conduits. The conditions necessary to cause a fire are that the insulation must be worn off both wires, and the bare wires must come in contact with each other and at the same time in contact with dry wood or some other combustible material. Even then the chances are that a fuse would be blown in the "cut-out box" and a fire prevented. E.E.B.

The measurement of electrical energy used in lighting is explained under ELECTRIC METER. Consult Franklin's *Electric Lighting,* and *Standard Handbook for Electrical Engineers;* Bell's *Art of Illumination;* Parker's American *Handbook for Electrical Engineers.*

Related Subjects. The reader is referred to the following titles in these volumes, in addition to those named above:

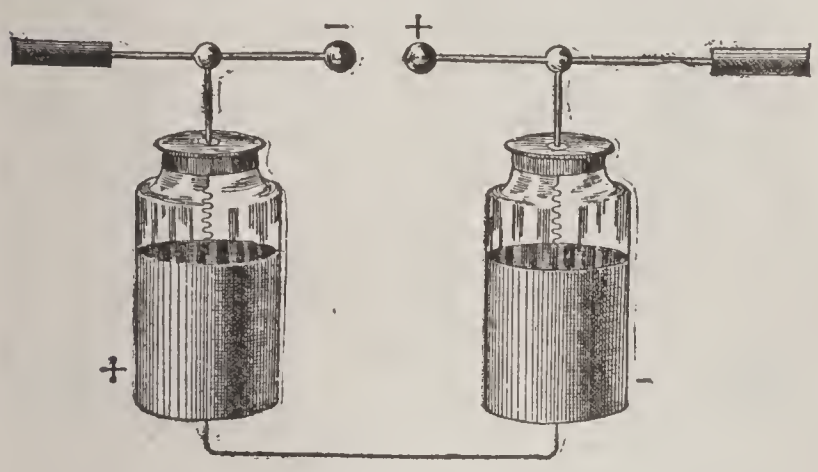
Current
Davy, Sir Humphry
Electric Battery
Insulator
Tungsten

ELECTRIC MACHINE, a machine which produces charges of positive and negative electrification by friction or induction.

The first electric machine was made by Otto von Guericke of Magdeburg, about 1663. It consisted of a globe of sulphur on an axis which could be turned by hand. When the dry hands were held against the rotating globe electric charges were produced by the friction (see ELECTRICITY). Revolving glass globes and glass plates rubbed by leather pads were used later. Only a small charge is produced by a single rotation of the glass plate, but the machine is so arranged that these charges accumulate; after many rotations of the plate

the small charges have been added together to produce very strong charges on the knobs of the machine. This principle, namely, the accumulation of small charges to produce a strong charge, is true of all electric machines, whether the electrification is produced by friction or by induction.

The induction electric machine is more effective than the friction machine. The former is used to-day in physics laboratories and in



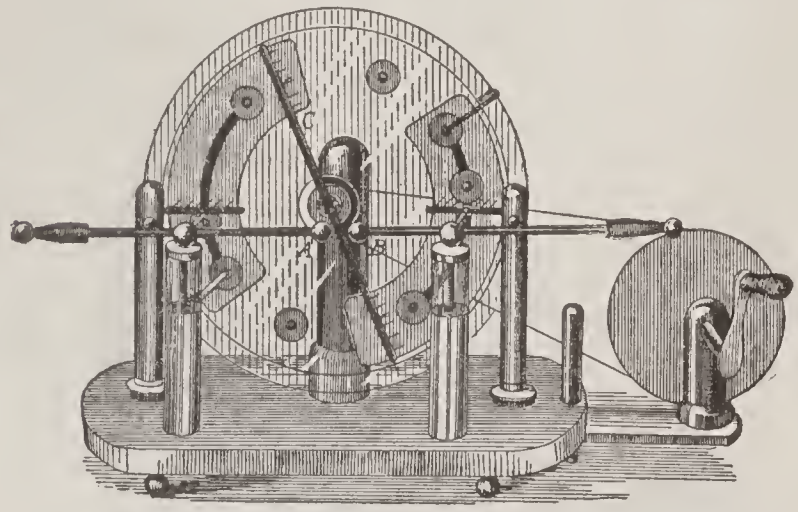
LEYDEN JARS

X-ray work; it is a device for charging with opposite charges two knobs connected with the inner coatings of two Leyden jars (see LEYDEN JAR). The outer coatings of the jars are connected together, the outer coating of each jar having a charge of the kind opposite to that of its inner coating. The distribution of the charges is shown in the illustration. Electric charges are continuously added to the knobs, the charges on the outer coatings of the jars being correspondingly increased. When the attraction between the two charges equals the breakdown strength of the air a spark passes between the knobs. If the knobs are connected to an X-ray or a Geissler tube there is a continuous discharge through the tube.

The Common Machine. The knobs *a* and *b* are connected to two collecting combs, as shown in the second illustration. These combs collect electric charges from metal studs on a rotary glass or vulcanite disk. These studs are charged by induction at the instant they touch the brushes of the rod *c*. Charges are induced on rod *c* by the charges on the sheets of tinfoil and varnished paper on the back of the fixed disk. The studs give up part of their charges to the sheets of tinfoil, so the charges on the tinfoil as well as on the knobs are increased by the rotation of the disk.

The energy of the electric charges is produced by the work done in rotating the disk. It is not correct to say that electricity is produced by the action of the machine. There is as much electricity in an uncharged metal rod as in the same rod with equal positive and negative charges at its ends; the machine merely produces a tension or strain in the electricity which already existed. A body in which this electrical force or strain exists is electrically charged.

Experiments with the Machine. If a person stands on a stool the legs of which rest on glass or rubber and touches one knob of the machine while it is being turned, his body becomes electrically charged. His hair, if dry, will stand on end. If another person holds his hand near the hair of the person who is receiving the charge the hair will turn toward his hand, because of electrical attraction. The person on the stool has no unpleasant sensation, no matter how strong the charge may be, for there is no sensation until a discharge takes place. If the person on the stool touches the hand of another person a spark passes between their hands, and each experiences a sharp pricking sensation. A number of persons, holding hands, may form a line; let the machine be turned until a small charge collects on the knobs and then the two at the



COMMON FORM OF ELECTRIC MACHINE

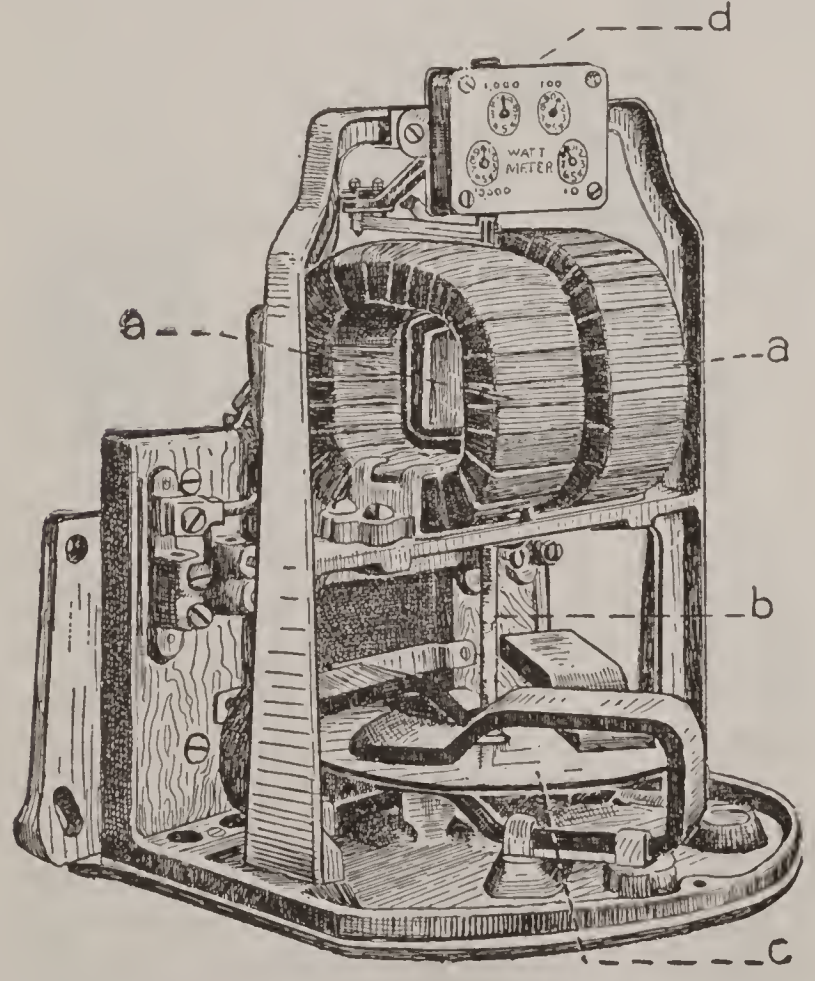
ends of the line may touch the two knobs at the same instant. Every person in the line will feel the discharge, but it will not be intense enough to be painful.

An experiment which is beautiful, especially in a darkened room, may be performed as follows: Draw a design in outline on paper. Then lay a plate of glass on the paper and paste bits of tinfoil or tea lead on the glass, following the outline on the paper beneath and leaving spaces of about one-eighth inch between the bits of tinfoil. Then attach two wires to the knobs of the electric machine and let the ends of the wires touch the pieces of tinfoil at the ends of the design. When the machine is turned sparks pass across all the spaces between the bits of tinfoil, illuminating the design.

E.E.B.

ELECTRIC ME'TER, a machine used to measure the quantity of electric energy consumed. Electric service companies charge for their service according to the readings of the electric meters in the premises of their customers. Since the kilowatt-hour is the unit of electrical energy, the meter measures kilowatt-hours or watt-hours, and for this reason it is sometimes called a watt-hour meter. See WATT; KILOWATT.

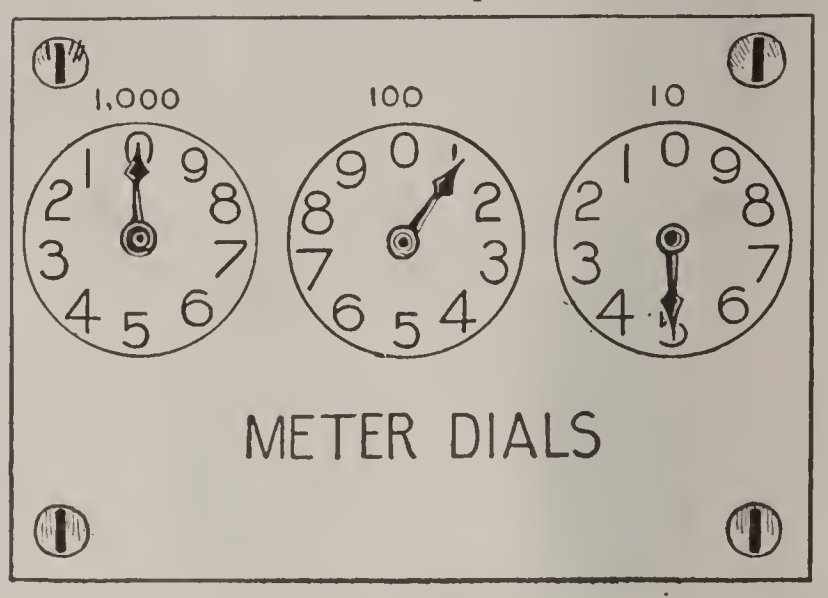
Description of the Meter. The principal parts of the watt-hour meter are the field coils *a a,* the vertical shaft *b,* to the lower end of which is attached a horizontal circular disk *c,* and the dials *d.* These are shown in the first illustration. The field coils are wound with coarse wire and are connected with the electric circuit in series. They are without cores and they carry the whole volume of the current. The armature is mounted on the shaft *b* and is wound with very fine wire, which forms a shunt circuit between the two wires of the main circuit and carries a current of small volume, but one that represents the full pressure by which the branches of the current



MECHANISM OF A METER
Explanation of the figure appears in the text.

are driven. The difference in pressure in the field coils and the armature causes the armature to revolve. The vertical shaft is connected with a system of clock work which moves the needles over dials, as described in the paragraph below.

Reading a Meter. An electric meter usually has either three or four pointers on the dial. Each pointer moves over a circular scale having ten spaces. The pointer on the right moves over one space while one kilowatt-hour is being used. When this pointer makes one complete revolution ten kilowatt-hours have been used. The second pointer makes one



A SMALL METER
The reading indicates fifteen kilowatt-hours.

revolution while the first makes ten revolutions, so that each space of the second scale indicates ten kilowatt-hours and one complete revolution of the second pointer indicates one hundred kilowatt-hours. Each space of the third scale indicates a hundred kilowatt-hours and each space of the fourth scale 1,000. In the illustration the number above the circular scale is the amount recorded by one complete revolution of the pointer.

To read a meter, note the number of complete spaces or divisions of the scale passed over by each pointer and write them down in order, beginning at the left. The result will be the number of kilowatt-hours. If a pointer is near a mark of the scale consult the pointer to the right to find out whether the mark has been passed or not. Unless the pointer to the right has reached or passed the zero, or, in other words, has completed a revolution, the other has not completed the division which it appears to have completed. See the second illustration for example of meter reading.

ELECTRIC MOTOR, *mo'ter.* By attaching a dynamo to a steam engine or a water wheel and applying the necessary power, the power of the steam or water is transformed into electric energy. This energy can be carried long distances by wires and connected to another dynamo, transmitting to it a motive power that may be used in the operation of machinery. An electric motor is a dynamo deriving its power from an electric current. It may be called a dynamo reversed.

Underlying Principle. The electric motor depends for its operation upon the power of an electric current to produce motion; wherever there is an electric current there is magnetic action all around the conductor along which the current flows. This may be illustrated by a simple experiment (Fig. 1). Procure a wine glass or small tumbler, a small bar magnet, a small quantity of mercury (quicksilver), an electric cell and several pieces of wire. Small copper wire for the battery connections is the best. The other wire should be large and strong. Assemble the apparatus as shown in the cut. Fasten the magnet (*a*) into the glass (*b*) with glue so it will remain in an upright position. Pour the mercury (*c*) into the glass. Attach the wire (*e*) to the standard (*d*) so that it will swing freely, and make it long enough to touch the surface of the mercury. When the wires (*f*, *f*) are attached so as to form a circuit with the battery, the wire (*e*) will rotate around the magnet. If the direction of the current is reversed, the wire will rotate in the opposite direction, the motion being caused by the magnetic force which is mutual between the magnet and the wire. This simple experiment, first performed by Faraday, pointed the way to the invention of the electric motor (see FARADAY, MICHAEL). If instead of the bar magnet and the straight wire we use a horseshoe magnet and place a coil of wire between the poles, as shown in Fig. 2, we have a simple electric motor. Since the causes of the motion described above are fully explained in the articles ELECTROMAGNET and ELECTROMAGNETISM, the reader is referred to those articles for this explanation.

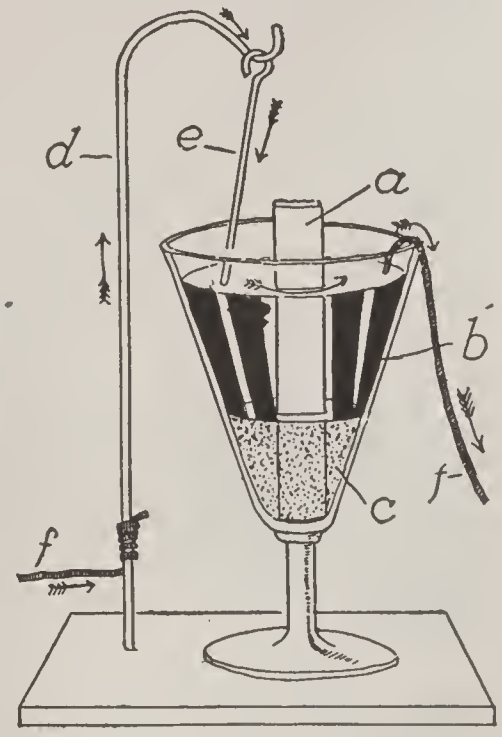


FIGURE 1
Explanation of this simplest form of electric motor is given in the text.

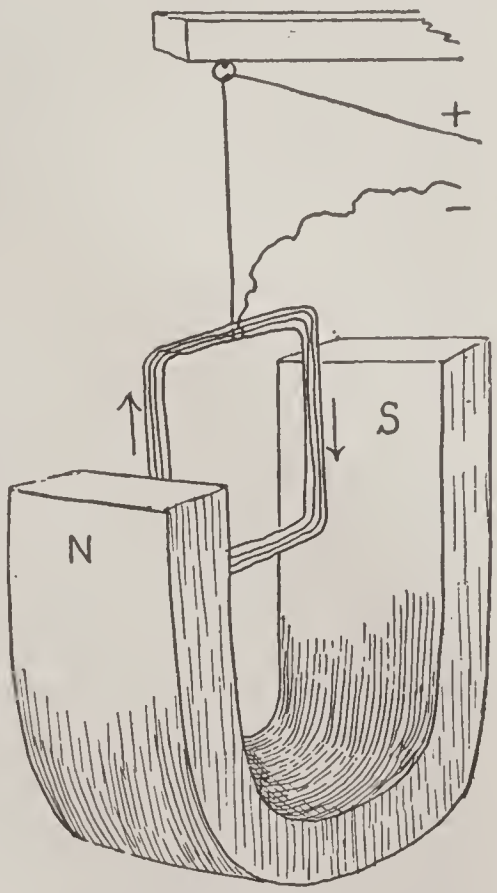


FIGURE 2

Operation. The necessary parts of an electric motor are the same as those of a dynamo (which see); these are the field magnets, the armature and the commutator. The current conveyed to the motor induces magnetism in the armature and also excites the magnetic field. The armature is so magnetized that the line of its poles is at right angles to that in the magnetic field produced by the field magnets. The attraction of opposite poles causes the armature to rotate to such a position as will place the line connecting its poles parallel to that of the magnetic field, but before it reaches this position the connections of two windings of the armature are automatically charged by the commutators and the current is reversed, shifting the polarity of the armature back to its original position, and the armature, still impelled to adjust itself to the new conditions, continues to rotate. This reversal of the current of the commutator is shown in Fig. 3 *a* and Fig. 3 *b*.

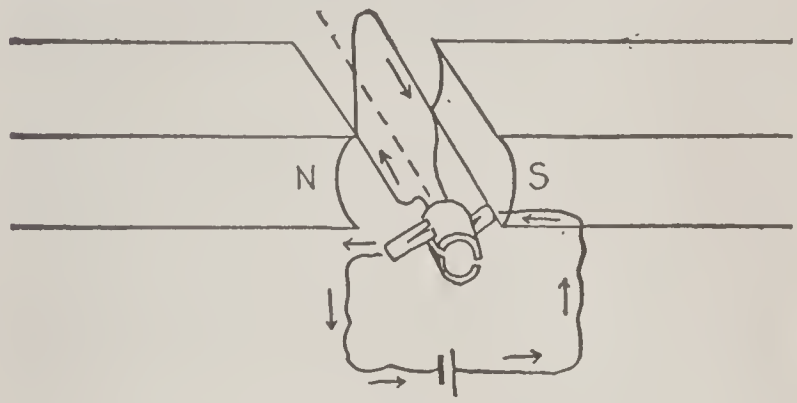


FIGURE 3, *a*
The coil cannot turn farther until direction is changed.

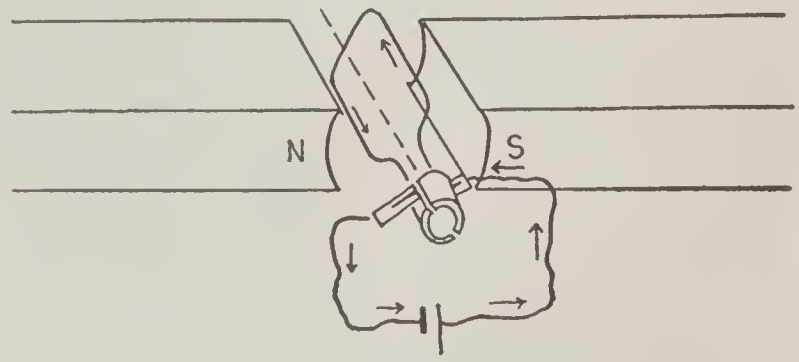


FIGURE 3, *b*
The current has changed direction in the coil, and the coil continues to turn.

For the sake of simplicity the motor described is of the ring-armature pattern, in which the armature consists of a soft iron

ring, wound with insulated wire; but these armatures are no longer used for commercial purposes, because the magnetic field acts only on the outer parts of each coil. The inner part is of no use in producing motion, and the ring armature requires about twice the length

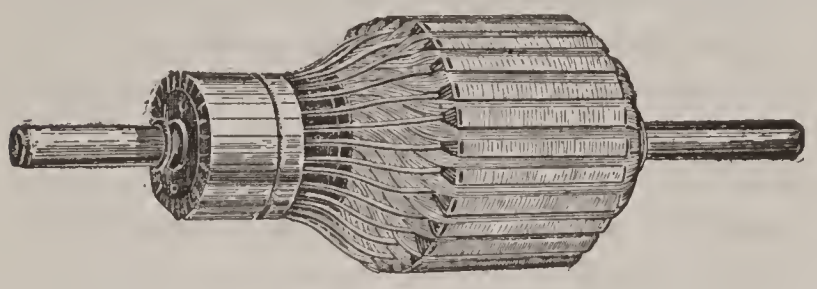


FIGURE 4
A drum armature.

of wire and therefore offers twice the resistance of the drum armature in general use, as shown in Fig. 4.

The simplest electric motor has an armature with two poles and a two-part commutator. But such a motor is not made for practical use. Some motors have four poles, and large ones have more; to all these the name *multipolar* is given.

Counter Currents. When the armature moves it causes a current that flows in the opposite direction and becomes an opposing force, which weakens the current causing the motion. The greater the speed of the armature, the greater will be this counter force, but at the same time that this counter force is increased by the speed of the armature, the direct electromotive force is proportionally increased so that there is little or no loss of power from this source. There are, however, two direct causes of loss of power. These are friction and the resistance offered by the conductor along which the current flows. No machine can transmit all the power it receives, for some of it must be used in the operation of the motor itself. Every conductor offers more or less resistance to the current it carries, so considerable power is lost in transit. For these reasons electric motors are smaller than the dynamos supplying them with power. See ELECTROMOTIVE FORCE.

Types of Motors. Various types of electric motors of all sizes are on the market, but all have grown out of the fundamental types first invented. Chief among these are the following:

The Series Motor. This is the simplest type of motor. The current passes through both the armature and the field coils. Its course can be traced by the arrows in Fig. 5. The power of this motor depends upon the power of the armature current and upon the strength of the field. Since an increase of current increases both the armature current and the strength of the field, a slight increase in current produces a large increase of power. The rule for the series motor is: For light loads the power increases as the square of the current strength. For heavy loads the increase in power is nearly in proportion to the increase of current strength, because the magnets become saturated and the armature alone is affected by the current.

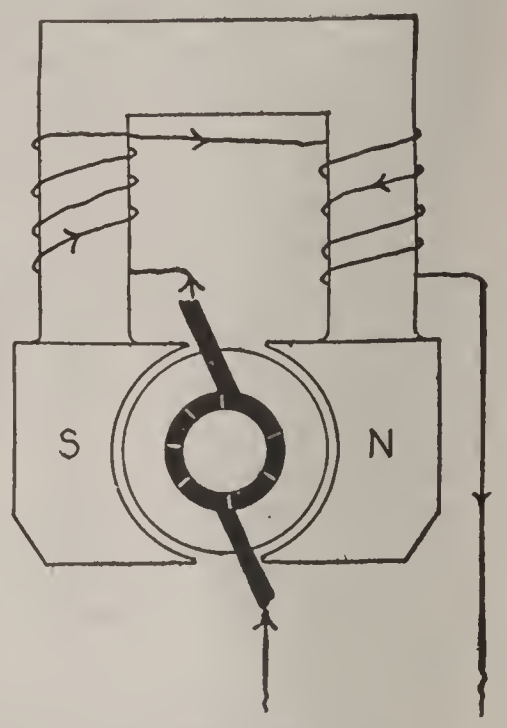


FIGURE 5
A series-wound motor.

The Shunt Motor. In the shunt motor the current is divided, one part going through the armature and the other through the field coils. The direction of each branch is shown in Fig. 6. The coils of the field magnets consist of many turns of fine insulated wire. Since the magnetizing effect of a current depends upon both its strength and the number of times it flows around an iron coil, the field is much stronger in the shunt-wound than in the series-wound motor. Because of the length of wire in the field coils they have such high power of resistance that changes of load which strongly affect the armature produce comparatively slight effects upon the field; consequently the shunt motor runs with a more uniform speed than the series motor.

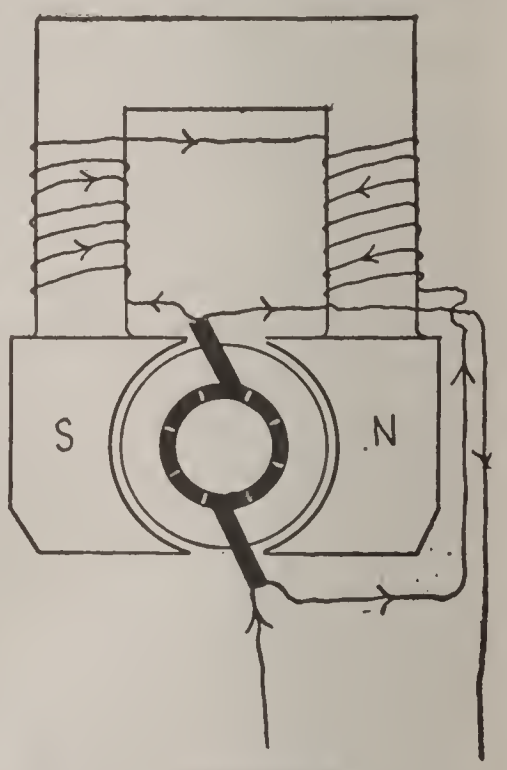


FIGURE 6
A shunt-wound motor.

The shunt motor is used where uniformity of speed is required, as in the operation of machines. The series motor is used where great power is required in starting and considerable variation of speed is necessary, as on electric cars.

The Compound Motor. The compound motor is a combination of the series and the shunt types. One branch of the current goes around the field coils, as in the shunt motor. The other branch, having a low resistance, goes around the field and through the armature coils. The current flows in the same direction in the two field coils. The division of the current and windings are shown in Fig. 7. Compound motors are used in rolling mills and other places where the load may be suddenly increased.

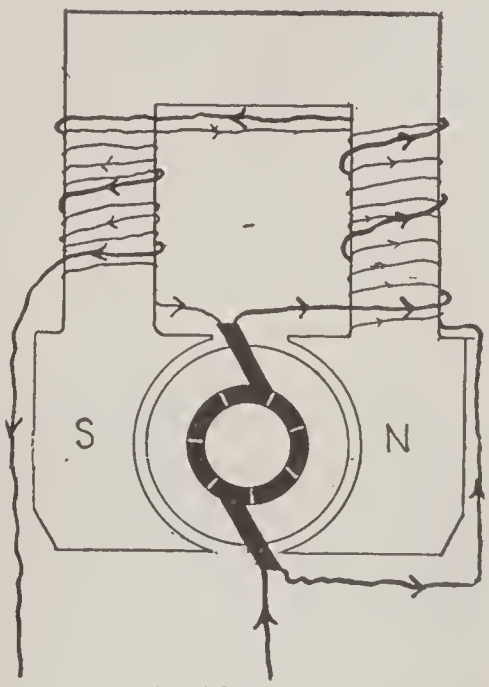


FIGURE 7
A compound-wound motor.

Uses. The electric motor is used for almost every purpose which requires power for operating machinery. Since electric power can be carried hundreds of miles with but slight loss, the electric motor makes available hundreds of thousands of horse power from water power sites; before its invention this immense power was useless because of its inaccessibility. The power generated at Niagara, for instance, is used to operate street cars more than two hundred miles away, and the street cars in San Francisco are operated by power generated by mountain streams over a hundred miles distant. Many small towns have become thriving manufacturing centers because they have obtained electric power from a distance. Electric motors are constructed in all sizes, from those that operate a sewing machine to the locomotive that moves the heaviest trains.

The application of the small motor which can obtain its power by connecting it with an electric light fixture to operate the churn, the washing machine and wringer, the vacuum cleaner and other household machines, has conferred a great blessing on many homes in both city and country. In nearly all modern factories each machine is operated by its own motor. W.F.R.

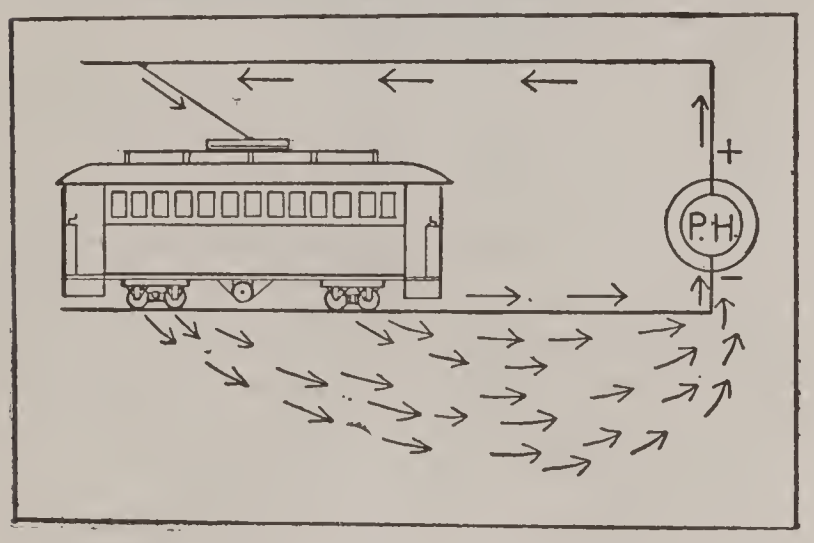
ELECTRIC RAILWAY, a railway on which cars or trains are propelled by electricity. Before the nineteenth century had run half its course, the idea of driving trains by electric power had begun to interest inventive minds. Thomas Davenport, a blacksmith of Brandon, Vt., attempted to build an electric railway as early as 1835. Three years later a Scotchman living in Aberdeen invented an electric locomotive. These first experiments had little practical significance, because experts had come to realize that so long as current had to be generated in batteries service on a large scale would be too expensive. It was the invention of the dynamo, furnishing a current of high voltage at a considerably less cost, that encouraged inventors to push their experiments. See DYNAMO.

Investigations were conducted both in Europe and in America. A working railway was shown at the Berlin exposition of 1879. In 1883 Thomas A. Edison and Stephen D. Field exhibited an electric locomotive at Chicago. The first overhead trolley line was built at Kansas City the following year, and four years later the street railway system of Richmond, Va., was equipped with electric power. The period of rapid expansion which followed may be dated from the successful experiments at Richmond. In city after city electric cars have taken the place of horse-cars on the street railways, until now the latter are rarely seen. Cable-cars, too, have largely been superseded. Improvements in the type of motor and the construction of cars went rapidly forward, and as they did so the electric car spread from the city to the country. Interurban lines, forming a network across the country, are everywhere bringing the town and the village nearer to the city.

As electric locomotives of increased efficiency are designed they are more and more substituted for steam locomotives. The first changes from steam to electricity were made to eliminate the smoke and dirt of coal on elevated railways, in tunnels and subways and at terminals in large cities. All trains entering New York City are now operated entirely by electricity. But, except in mountain regions where water power is plentiful, electricity has not been found more economical than steam. It is true that electric locomotives may be operated more cheaply, but interest on the enormous cost of installing the electrical equipment is usually greater than the saving. Perhaps the greatest step in the history of electric railroading was the introduction in 1916 of electric engines on 440 miles of the main line of the Chicago, Milwaukee & Saint Paul Railway in the mountains of Idaho and Montana. These engines are 112 ft. 8 in. long and haul passenger and freight trains across the continental

divide at greater speed and less cost than is possible with any other type of locomotive. The force of the train on a descending grade is utilized to generate thirty per cent of the power taken from the trolleys in climbing. See LOCOMOTIVE, subhead *Electric Locomotive*.

Trolley Lines. In the overhead trolley lines so familiar in city streets, the current is generated in a central power house, and passes along heavy copper wires above the tracks. In the usual type of car it is carried through a



THE ELECTRIC CAR

The illustration shows how the electric current reaches a trolley car and returns to the power house (P. H.) through the rails and the earth.

small trolley wheel down the trolley pole conductor to the motors under the car, and returns to the power house along the tracks. The trolley wires may be suspended between poles set on either side of the street, or may be attached to an arm of a single pole placed between the tracks.

Conduit System. In New York and Washington and some European cities, where overhead wires are not permitted, the current is supplied to cars through conductor rails, sunk in slots similar to the cable-slots once used for grip-cars. An arm extends from the motors through the slot and takes up the current by means of rubbing blocks, which press against the charged rail.

Third-Rail System. Wherever it is practicable, the third-rail system has found favor. It is employed almost universally on elevated systems and in subways, and is widely used on interurban lines. The current is conveyed through a third rail, placed beside the track; the motors are fed by shoes of metal which slide along this rail. Such a system is dangerous because of the exposed position of the rail that conveys the current, and it can be used with safety only where the right of way is closed to the public.

Electric Cars. From street cars to locomotives, the construction of electrically-driven vehicles is simple. The essential parts of a street car are one or more electric motors, attached to the driving axles of the car by gears, and a switch on the platform for controlling the current. The motors and the running gear are attached to the trucks on which the car rests, and all parts which would be affected by dust are enclosed in metal casings. (For an explanation of the workings of the motor, see ELECTRIC MOTOR.) The revolving armature shaft, driven by the current received from the power house, is now generally connected directly with the driving axles by cogwheels. For ordinary city service the cars are equipped with four motors—one for each axle. Such motors vary greatly in power; those for light service may develop only twenty-five horse power each, while the motors used for interurban traffic will often develop 225 horse power. The engines used by the Pennsylvania Railroad in its New York ternimals are driven by motors of 2,000 horse power.

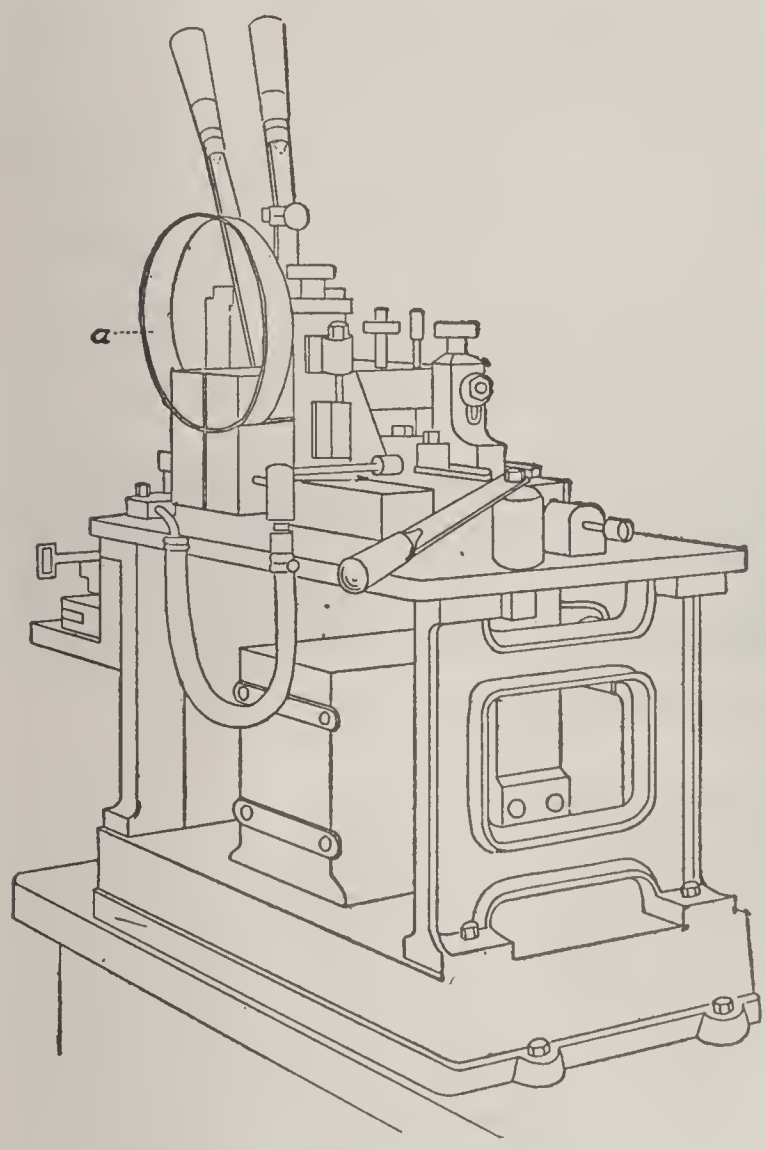
Advantages of Electric Power. The superiority of electricity as a motive power has been thoroughly demonstrated in the case of street railways and for interurban service. So far as steam railways are concerned, the case is not yet so clear, but the day is approaching when all trains will be economically run by electricity. The electric locomotive needs neither coal nor water and is less affected by cold weather than is the steam locomotive. It consumes no power while standing still, whereas a steam locomotive burns about one-half as much coal then as when running. But the cost of installing and maintaining electric equipment is enormous.

Mileage and Valuation. The *Electric Railway Journal* gave the electric mileage of the United States as over 48,000 in 1922. The capitalization reached about two and a half billion dollars. Canada, in the same year, had about 1,450 miles of electric lines, capitalized at more than $111,500,000. See, also, ELECTRICITY; ELECTROMAGNETISM. G.B.D.

ELECTRIC WELDING. The rails of street car tracks are frequently welded so as to form one continuous rail and therefore one conductor for the electric current, the trolley wire and the windings of the motors forming the other parts. This welding is done by means of the electric arc, the arc being placed near the junction of the metals to be welded. A flame from the arc falls upon the metals and melts the parts that are in contact. The above

is one of many instances of welding by means of electricity; in welding steel rails the carriage containing the apparatus for welding moves along the track, stopping at each spot where the work is to be performed.

In another form of electric welding a current is caused to flow through the metals, the



ELECTRIC WELDING MACHINE

In the illustration the circular band *a* is being welded. The ends to be fused are in contact at the lowest point in the circle. The machine shown will weld 200 steel bands in an hour, for only a few seconds are required to make an electric weld. A heavy current of electricity at a low voltage is passed through the abutting ends of the metal pieces to be welded, thereby generating heat locally at the points of contact, while at the same time pressure is applied to force the parts together.

ends to be welded being placed in contact, as shown in the accompanying illustration of a small electric welder. Since the resistance of this contact is very great, intense heat is developed, fusing the metals at the contact and making a perfect junction. E.E.B.

ELECTROCHEMISTRY, *e lek tro kem' is tri,* that branch of chemistry in which chemical changes are brought about by electric energy. In the voltaic cell chemical energy is converted into electric energy (see ELECTRIC BATTERY). This electric energy can again be transformed into chemical energy, and this principle underlies many thriving and important industries. The practical operations of electrochemistry may be considered under two groups—those which cause chemical changes at ordinary temperatures, and those in which the changes occur only at the high temperatures possible in the electric furnace.

A simple illustration of a change of the first sort is found in the analysis of water, or its separation into its component gases, oxygen and hydrogen. Electroplating (which see) is an extensive application of this sort of electrochemistry. Copper is also refined by the same process (see COPPER, subhead *Preparation*).

Metals which are extracted from their ores with great difficulty by ordinary processes are readily separated in the intense heat of the electric furnace. For instance, the production of aluminum on a commercial basis was not possible before the invention of the electric furnace (see ALUMINUM, subhead *Its Manufacture*).

The electric furnace possesses another advantage, that is, its power of separating the decomposed compounds by electric attraction, as in the production of aluminum. The metal when freed from its ore gathers around the anode, or positive pole, in the furnace, while the other substances are attracted to the cathode, or negative pole. In this way many substances in use in the arts are produced, chief among which are carbide, used in the production of acetylene gas; carborundum, a valuable abrasive; caustic soda; chlorate of potassium, and chloride of lime and bleaching powders. An excellent quality of graphite is also manufactured, rivaling that of the best mines.

Electrochemistry is a comparatively new branch of chemical science, and although it has made rapid progress since the beginning of the twentieth century it is doubtless still in its elementary stage.

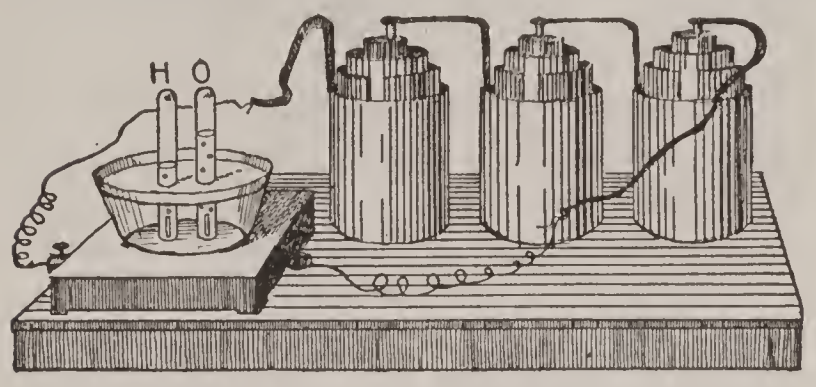
ELECTROCUTION, *e lek tro ku' shun,* a legal method for the infliction of the death penalty by passing through the body of the condemned criminal an electrical current of not less than 2,000 volts. Such a strength of current is enough to produce instant insensibility and painless death. After a long investigation by the legislature of the state of New York this method was pronounced more humane than hanging, and it became effective in that state in January, 1889. According to the law in that state, which has been taken as a standard by other states, there must be present at an execution, besides the prison warden, twelve citizens, seven deputy sheriffs, two physicians and one or two ministers, as the doomed man may

desire. In the article CAPITAL PUNISHMENT are listed the names of other states which followed New York's lead.

ELEC'TRODE, either terminal leading from an electric battery or other source of electromotive force. The word means *the electric way.* It is by way of an electrode that a current enters or leaves an electroplating bath, a Crookes tube, etc. See CROOKES TUBES.

ELECTROLYSIS, *e lek trol' i sis,* the process of decomposing a chemical compound by the action of an electric current, that is, separating the compound into the original elements or parts of which it is constituted.

A simple experiment illustrating electrolysis can be performed as follows: Connect four dry cells in series; place the ends of the wires

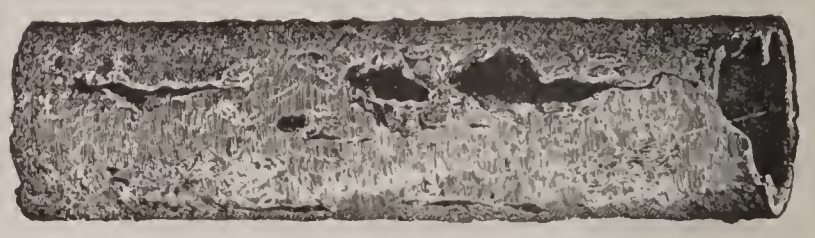


ANALYSIS OF WATER BY ELECTRIC CURRENT

leading from the dry cell battery in a solution of common salt in water. Bubbles will rise rapidly from the wire leading from the zinc of the battery, the cathode, or negative pole. In a short time a yellow color will appear in the solution at the anode, or positive pole. The salt has been separated into two parts, sodium and chlorine; sodium ions bearing a positive charge go to the cathode. There the sodium reacts with the water, setting hydrogen free. Chlorine ions bearing a negative charge go to the anode. An *ion* is one of the substances which appear at the poles when electrolysis occurs; that at the positive pole (the anode) is called *anion,* and that at the negative pole (the cathode) is called *cation.*

A substance which is decomposed in this way by an electric current is called an *electrolyte.* All acids, bases and salts are electrolytes. In some applications of electrolysis the electrolyte is kept in a molten state, as in the separation of aluminum from its ores (see ALUMINUM, subhead *Its Manufacture*). Some of the useful applications of electrolysis are the separation of some of the metals from their ores, or electric smelting; the manufacture of certain chemicals, such as bleaching powder and potassium chlorate; electroplating, and in refining copper (see COPPER, subhead *Preparation*).

An injurious effect of electrolysis is the decomposing of gas and water mains which run



WATER PIPE DESTROYED BY ELECTROLYSIS

parallel to the track of a trolley line in which the track is used as the return circuit. At certain places where the ground is a good conductor the current leaves the track and flows along the gas or water pipes for some distance. Where the current leaves the pipes electrolysis of certain compounds in the soil takes place, setting free chlorine or some other element to attack the pipes and injuring them by eating away the metal. The remedy lies in providing proper lines for conveying return currents.

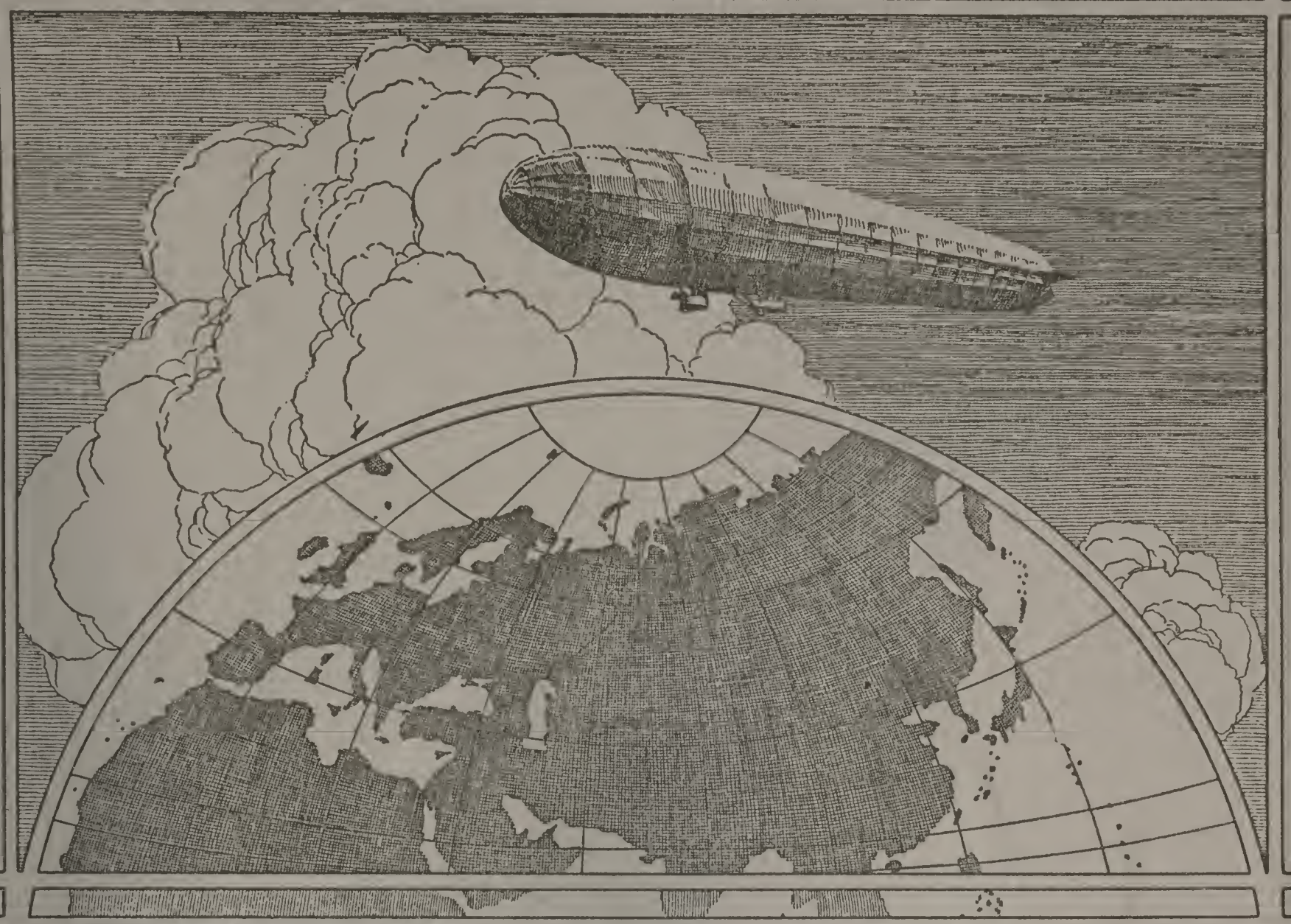
Laws. There are three well-established laws relating to electrolysis, as follows:

1. The electrolytic action of the current is the same at all parts of the circuit.
2. The same quantity of electricity decomposes chemically equivalent quantities of different electrolytes.
3. The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current.

E.E.B.

End of Volume Three

THE WORLD BOOK



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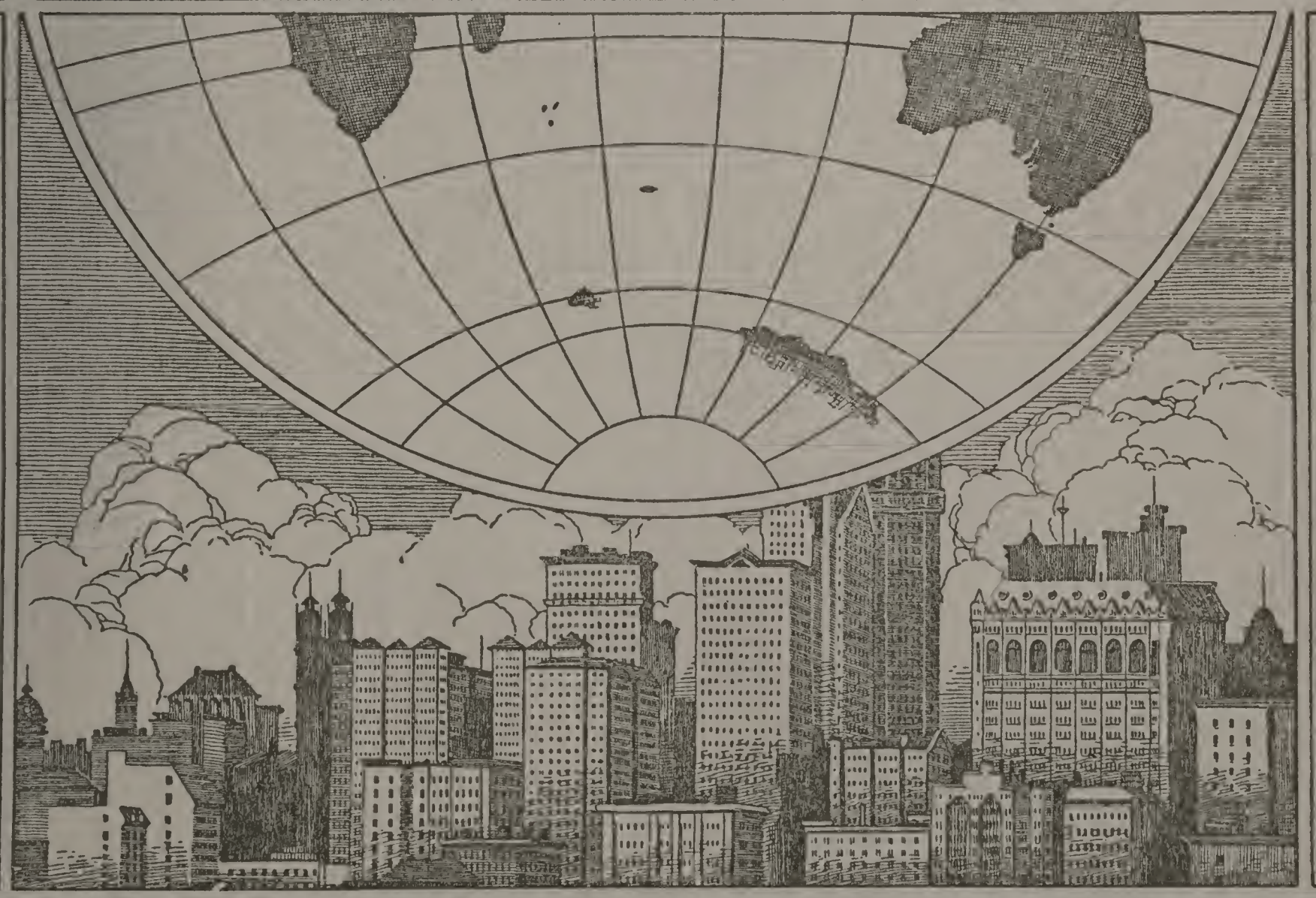

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